



COLONY AND PROTECTORATE OF KENYA

DEPARTMENT OF AGRICULTURE
ANNUAL REPORT
1957

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**DEPARTMENT OF AGRICULTURE
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CORRIGENDA

Annual Report, 1956—Vol. I

EXPORTS, page 13.

Amend first line to read "Exports of the following ten commodities . . ." and
insert:—

7. Pineapples	.. .. .	(—)	—	£765,631
and change existing Nos. 7-14 to 8-15.				

RICE, page 22.

Last sentence "Deliveries to Produce Control . . ." should be a fresh paragraph.

SISAL, page 22.

Amend 826 tons, Machakos African Sisal Scheme to 701 tons.

TEA, page 23.

Amend the acreage in Central Province (penultimate paragraph) from 36,560 to 365.60 acres.

DEPARTMENT OF AGRICULTURE ANNUAL REPORT 1957

VOLUME I

PART I—AGRICULTURE IN 1957

Review of the year

Two factors occurred in 1957, a season good for crop and livestock production and a marked downward trend in world commodity prices, which indicated that the mixed farmer, if he is to expand his economy, must be prepared to enter highly-competitive world markets as a thoroughly efficient low cost producer of maize, butterfat, bacon, wool and, disease factors permitting, of mutton, lamb and beef. Kenya has come a long way since the Great Depression in broadening its agricultural economy although it is a cause for disquiet how dependent certain areas still remained upon maize in 1957 and how little prepared were farmers to convert the maize surplus into pig and dairy products, the economy of which conversion is at present under departmental study. In 1957 it is estimated that a surplus of 800,000 bags of maize will have been produced, for which the farmer could get Sh. 39/98 per bag so long as all could be absorbed on the local market, but which was worth about Sh. 15 per bag on the farm when it had to be exported.

The maize surplus was brought about by good weather in all Provinces, deficit African districts becoming surplus producers and thereby reducing consumption, and by prices guaranteed to the producer by the Troup award of 1952. Short-term finance for cereal crops, but not for livestock production, advance against guaranteed minimum returns, whereby for instance farmers in Trans Nzoia could borrow up to £450,000 in 1957, has deterred farmers from switching more quickly to livestock production and has tied up their money in specialized equipment without the ready finance to effect the switch fairly rapidly, although Government through the Board of Agriculture has assisted with £1,400,000 since 1952 in rehabilitation and development loans to farmers for fencing, water supplies, dips and sprays and for the purchase of livestock principally. As a consequence, in the European Highlands maize production has expanded steadily by 177,000 bags from the 1950-53 three-year average of 719,000 bags to 896,000 bags in 1955-58. In the same period African production has dropped by 400,000 bags from the mean three-year peak of 1,150,000 bags reached in 1952-55 to a mean of 750,000 bags in 1955-58 due to less favourable seasons, to the incidence of marketing charges and cesses for African district councils and export, creating a disparity between the cost per bag of maize meal at Sh. 60 and the Sh. 27/33 received by the grower for his maize, and to a switch to other cash crops in suitable areas.

The severe incidence of stem rust in 1955 and 1956 brought the area planted to wheat in 1957 down by over 90,000 acres in the two years to 251,400 acres. While stem rust was less severe in 1957, the appearance of new races of rust continues to keep ahead of the plant breeder, and the estimated production of 1,100,000 sacks will fall short of East Africa's requirements by some 400,000 sacks, the import of which can be used to improve the baking quality of the poorer Kenya wheats. Wheat-breeding facilities and techniques are being

greatly improved at the Plant Breeding Station, Njoro, by the addition of 194 acres of land in 1957, by the construction of new laboratories, by the Senior Plant Breeder's study tours in America in 1956 and 1957, by expanding staff, by drawing on the World and F.A.O. wheat collections and by the most welcome financial contribution of £13,400 per annum from the Cereals Producers' (Scheduled Areas) Board and its participation on the Cereals Research Advisory Committee. To maintain yields, priority of breeding must concentrate upon rust resistance for many years, but attention is paid to baking quality characters in selection.

The Department's advisory and farm planning services, with their ancillary soil conservation and dam construction units were in full demand from farmers during the year in their efforts to replan and intensify their farming systems.

The coffee crop, representing in value 30 per cent of Kenya's agricultural exports in 1954 and 60 per cent in 1956, will yield around 20,000 tons in 1957-58, the third bumper year running and for the first time the African contribution yielded over 2,000 tons, a significantly high proportion being in the top quality classes. New African planting exceeded 5,000 acres in 1957 and will continue at no less a rate for the foreseeable future, contributing an ever-increasing amount to the Colony's coffee export tonnage. There is likely to be a drop in pay-out to growers and co-operative societies from £520 per ton last season to around £450 in the current season and, with the Latin American stockpile, growers must be prepared to face a further decline in coffee prices. The Coffee Berry Disease team made headway during the year on the control of the disease and in seeking safe and economic fungicides.

The potential importance of tea is indicated by the fact that, of the 70,570 acres licensed in the European Highlands, 40,588 acres remain to be planted while the amount of money being invested in tea development is most encouraging. A similar potential lies in the African lands but development will depend upon the success of the Nyeri/Embu tea scheme where 600 acres have been planted and the new tea factory opened, and of the schemes in Kericho and Kisii where African-grown leaf will be sold, it is hoped by agreement, to neighbouring tea estates in the early stages, some 51 acres being planted in 1957.

With 59 research officers and 69 research assistants and £693,425 voted in 1957-58, to which coffee, sisal, wheat and cotton producers contributed, the Research Services continued to tackle the problems of the farming industries under the guidance of advisory committees for coffee, pyrethrum, sisal, cereals, grassland and overall agricultural and veterinary research on all of which sit practising farmers. With the separate but fully co-ordinated research being carried out by the High Commission Services, by the Colonial Pesticides Research Unit, by the Tea Research Institute, by the Empire Cotton Growing Corporation and by the laboratory services of the Pyrethrum Board, for a small country Kenya is very well served in regard to agricultural research. Post-war expansion is now bearing fruit and will do so in increasing measure in the years to come.

The most encouraging advances in African farming in 1957 have been in fields less easily appreciated or accepted by the peasant husbandman. In Marama Location of North Nyanza, in Elgon Nyanza, in the Taita Hills and amongst some individuals in Southern Province, private schemes for land exchange and consolidation and enclosure have been going ahead unobtrusively to augment the more conspicuous enclosure of land which has taken place in Kericho and Kisii in recent years and the remarkable progress in land consolidation achieved by the Provincial Administration, the Agricultural Department and the people in Central Province where in two years, out of some 1,200,000 acres, 674,000 acres

of fragments have been measured up and 290,524 acres demarcated on the ground, including 33,309 acres laid out for settlement, two-thirds in Meru, and 35,000 acres on 3,400 farms for farm plans and farm layouts. An enclosed holding tenable as a single unit is essential if any sound system of farming is to develop. Some 150,000 to 200,000 holdings will be set out in Central Province over a period of three or four years and, to ensure that the homestead and the permanent cash crops such as coffee, tea, wattle or pyrethrum are sited to interfere to the minimum with the rotation farming area and to get farming on the right lines, a system of rapid farm layout is necessary. All Agricultural Instructors are being trained to do this. Regular follow-up with advisory visits is then essential to ensure sound progress.

Farm Institutes are being developed where the better farmers and Agricultural Instructors can go for short courses to learn how to run a planned holding, to grow cash crops, to manage improved milk cattle or to keep pigs. Again the important thing is to get as many farmers through these courses as possible and for these courses farmers are prepared to pay Sh. 2 a day for their board. Farm Institutes are being established in Nyanza at Bukura, Kabianga and Kisii, for Rift Valley Province at Kaimosi, welcome funds coming from United States International Co-operation Administration for these, and in Central Province in Meru, Nyeri and Kiambu.

Grazing improvement and management schemes have made particular progress in Rift Valley and Southern Provinces. In Kitui District locational grazing management schemes, scratch ploughing and seeding of grass in denuded areas, exclusion of stock from such areas for the initial period of recovery, the construction of a better spread of water supplies for which the African District Council has now applied a cess of Sh. 2 per head of cattle and 50 cents per head of small stock to yield £20,000 a year, and regular cattle sales have been shown by a recent stock census to have brought the carrying capacity of the land into reasonable balance with stock numbers. In Rift Valley Province five main rotational grazing schemes totalling 200,000 acres are working satisfactorily, two in Baringo, three in West Suk. Surveys and planning are in progress to extend the area to 400,000 acres by 1960. In Elgeyo and Nandi too, good progress is being made with skeletal planning, soil conservation and reticulation of water supplies to individual holdings. In Elgeyo in 1957 the people paid from Sh. 9/50 to Sh. 13/50 per acre for the protection of 12,000 acres of land with cut-off drains and have requested similar treatment for a further 38,000 acres. To keep livestock in good health, water supplies on individual holdings are essential. In three areas of Nandi, Kaptumo, Kaplamur and Ndalat, 46,000 gallons of water daily have been made available to 4,600 acres of holdings at a cost of £1 per acre. These are but a few examples of the many services for which Africans were prepared to pay in 1957.

Major policy decisions were laid down during the year on animal husbandry and livestock improvement in African areas. Because crop and animal husbandry are indivisible in the farming system and because of a greater spread of staff in the field, application of animal husbandry policy was placed in the hands of the Agricultural Department subject to general approval of policy by Provincial Agricultural Committees and of health and breeding considerations by the Director of Veterinary Services. It was further laid down that in the Nyanza, Southern and Coast Provinces, in Rift Valley below 6,000 feet and in Central Province below 5,000 feet, success with artificial insemination having been achieved, livestock improvement would be based on the Sahiwal and other improved Zebu breeds from the 12 Livestock Improvement Centres of the Veterinary Department. In the higher areas of Central and Rift Valley Provinces

on well-farmed holdings whose output was held back by lack of productive Zebu cattle, European breeds might be introduced by artificial insemination schemes or by disease-free heifers, small breeds with high butterfat production being better suited to the African economy, skim milk providing the protein required in the human diet and the surplus being utilizable for pig production. These steps have been made possible by the close harmony in which officers of the Veterinary and Agricultural Departments at all levels have worked in recent years.

Two final points in this review of the year. The irrigation schemes at Perkerra and Tebere made steady progress and the first tenants were settled on the land. At Hola a start was made on the second phase of developing 500 acres. Of the irrigation investigation stations, Mwea was fully established whilst that on the Kano Plains was held up awaiting allocation of the land. With United States International Co-operation Administration financial aid for irrigation development, for agricultural education, for range management investigation, for soil classification and for cash crop investigations, the arrival of two experienced technicians, Mr. C. Enlow, grassland expert and leader of the team, and Dr. A. Mehlich, a distinguished soil scientist, was very welcome.

Weather

Climatic conditions were in general favourable through the year. There was unusually heavy rain throughout the Colony in the latter half of January particularly in the main coffee areas and in the Coast Province. Mombasa had four times its normal, and Nairobi, with 6.45 inches recorded its highest total since records began. This was followed by a dry February except in South Nyanza and Kericho Districts. Some areas of the Uasin Gishu had no rain at all.

March was also dry until towards the end of the month when rain brought monthly totals to near-average, and well above average along the Coast and in the Nyanza, Mt. Kenya and Trans Nzoia areas. April rainfall was quite good, but in May twice the normal amount was common in the Central, Southern and Rift Valley Provinces. Appreciable rainfall in June is normally confined to the Highlands and Lake areas, and all areas experienced average or above average amounts. During the period July to September conditions were generally drier than usual although in September the coffee areas, the Coast and Mt. Kenya District had at least their expected amounts. The "short rains" began in the majority of areas at the end of October and good rains fell during the whole of November particularly east of the Rift. In some districts of the Central, Northern and Coast Provinces it was the wettest November since official records began. Rainfall continued during the first two weeks of December the eastern half of the Colony receiving most. A sudden improvement in weather affected all areas about the middle of the month.

In the Rift Valley Province uneven rainfall distribution resulted in delayed planting and difficult harvesting in some districts. Some hailstorms were reported from the Trans Nzoia. The heavy rain towards the end of the year in Baringo greatly benefited the ranching areas. Crops in Nyanza, particularly cotton and coffee, were adversely affected by the dry period in June and July and the delayed onset of the short rains. The very wet conditions experienced in the Kikuyu districts had an adverse affect on the bean crop and potatoes generally suffered from blight. At the Coast the intensity of the short rains reduced the cashew nut crop and affected its quality.

(This section and Table A has been compiled with the help of notes provided by the Director of the East African Meteorological Department.)

TABLE A.—SOME FIGURES OF RAINFALL IN THE AGRICULTURAL AREAS OF KENYA, 1957

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Per cent
Kwale Agric. Dept. 94.3901	3.17 248	0.60 78	3.72 171	8.23 137	9.16 98	1.93 51	3.98 130	1.40 62	3.65 141	4.37 127	7.57 206	7.11 232	Total Per cent
Ruiru Jacaranda 91.3684	8.35 609	0.64 68	1.91 63	12.65 123	15.99 319	2.64 133	0.48 62	0.35 29	1.27 80	3.44 127	6.45 149	3.87 121	Total Per cent
Kakamega D.C. 89.3401	5.03 237	2.49 70	7.92 147	17.28 181	9.22 87	7.11 92	8.63 125	8.51 94	7.80 109	3.02 65	2.63 69	4.28 135	Total Per cent
O. H. Knight, Kitale 88.3410	0.48 62	0.00 —	1.72 71	5.31 91	6.34 110	2.12 47	3.12 52	6.32 104	0.83 24	1.75 59	2.52 117	1.78 220	Total Per cent
Thomson's Falls K.C.C. Ltd. 89.3615	2.96 296	0.25 21	1.65 89	8.46 197	6.79 197	3.94 112	2.05 37	4.14 64	0.67 26	1.79 133	4.81 189	4.64 230	Total Per cent
Nyeri P.W.D. 90.3617	3.74 223	1.54 93	1.99 75	9.17 128	12.62 186	0.41 33	0.82 59	1.11 74	1.98 162	5.24 152	6.26 147	5.03 172	Total Per cent
Plant Breed Stn., Njoro 90.3521	1.49 154	0.25 20	2.41 94	4.32 83	9.44 224	3.07 89	1.48 33	2.49 50	0.36 14	1.30 66	4.84 189	2.33 104	Total Per cent
Naivasha Expt. Stn. 90.3681	2.23 178	1.36 130	3.26 157	6.05 127	8.87 261	2.29 104	1.74 101	1.96 95	2.01 105	2.21 110	1.65 65	2.52 189	Total Per cent
Kansabet D.C. 89.3518	4.70 237	0.00 —	5.98 136	5.44 70	7.34 86	4.64 72	4.14 62	7.51 94	2.08 36	2.30 67	3.83 133	3.29 156	Total Per cent
Molo Rly. Stn. 90.3518	3.47 280	0.35 19	2.87 77	5.80 83	8.61 157	5.00 105	2.86 57	5.31 76	1.36 35	0.49 20	4.30 130	1.22 49	Total Per cent
Lumbwa Mtaragon 90.3527	2.36 147	2.71 114	3.14 82	8.89 121	7.71 117	5.23 108	2.73 49	4.78 78	2.04 50	1.61 65	3.57 130	5.47 252	Total Per cent

Food Production in African Areas

In Nyanza Province long rains crops were generally good except in Kericho District. Short rains crops are poor except in the higher wetter areas. Africans have tended to retain a greater proportion of long rains production as a result of poor short rains crops. Good yields of maize have been harvested in the Nandi District of Rift Valley Province, the only district in the Province which has an annual exportable surplus. The crop in Baringo and Elgeyo was sufficient for local consumption. 1,600 acres of wheat, nearly all in the Elgeyo District, is estimated to have been planted by African growers. The staple crops of sorghum and finger millet continue to provide subsistence needs in Baringo, Elgeyo and West Suk.

In Central Province maize crops were again good, there being a record crop in Meru District and good crops from Fort Hall and Embu. Pulse crops were poor in Kiambu and Fort Hall but good potato crops were lifted in most districts. Two good seasons in the Southern Province resulted in the export to Maize Control of various grains and pulses for six months during the year. In the Coast Province food was plentiful throughout the year with a steady export to the expanding Mombasa market although in some areas there was a tendency to oversell.

Agricultural Exports

The total value of agricultural exports decreased from £25,412,490 in 1956 to £23,448,278 in 1957. This was due to a decline in the value of coffee exported.

Exports of the following commodities exceeded £500,000.

		Position in 1956	1956 £	1957 £
1. Coffee	.. .. .	(1)	13,652,604	10,812,281
2. Tea	.. .. .	(2)	2,615,677	2,860,612
3. Sisal	.. .. .	(3)	2,075,303	2,078,012
4. Wattle Extract	.. .. .	(4)	1,501,332	1,521,875
5. Pyrethrum (incl. Extract)	.. .. .	(5)	1,200,580	1,103,554
6. Cattle Hides	.. .. .	(8)	607,616	800,877
7. Sheep and Goat Skins	.. .. .	(9)	518,337	634,165
8. Pineapples	.. .. .	(6)	765,631	584,358
9. Butter	.. .. .	(7)	615,715	506,959

Table C gives domestic quantities and values of exports of Kenya produce for the years 1939 and 1954-57 inclusive.

Crops

Cashew Nuts.—A single agent was appointed to handle the 1957 crop. This agent secured a contract for 1,000 tons enabling a price of 30 cents per pound to be paid to the producer. This was from 5 to 10 cents per pound better than prices obtaining in Tanganyika. Heavy rain during the crucial harvesting period, in spite of rigid inspection, resulted in serious deterioration and contractual losses. The crop is expected to amount to 1,500 tons of which 1,000 tons are for export and 500 tons for processing. Trial plantings have been made in the lower areas of Embu District.

Cassava.—In Nyanza Province apart from Kericho District acreages have increased. Growers remain reluctant to sell to the Nyanza Marketing Board mainly on account of the price offered, those in the Elgon area finding a more profitable market in Uganda. Bulking and distribution of mosaic resistant varieties continues. It is estimated that 1,000 acres is now planted in the Kerio Valley as a famine relief crop and there are prospects of a surplus finding its

way out through Elgeyo if transport difficulties can be surmounted. In Central Province increased plantings are being encouraged in the lower areas both for food and famine insurance. Coast Province estimate that 360 tons wet cassava was marketed from the districts at an average price of 5 cents per pound.

Castor Seed.—44,163 bags valued at £124,391 were exported from the Southern Province mainly Kitui District in 1957. Production in the Coast Province is estimated to total 489 tons worth £21,226. Of this 307 tons is from Malindi Sub-district.

Crops Scheduled under section 109, Agriculture Ordinance, 1955

Production estimates for the 1957 crops from Scheduled Areas are :—

				<i>Acreage</i>	<i>Average Yield Bags per Acre</i>	<i>Total Yield Bags</i>
Wheat	..	..	..	255,600	4.86	1,242,385
Maize	..	..	..	167,026	8.04	1,343,488
Barley	..	..	..	62,610	7.60	475,968
Oats	..	..	..	30,711	8.43	259,102
Sunflower	..	..	..	12,614	3.46	43,747
Linseed	..	..	..	3,122	3.71	11,605

The wheat acreage continues to show a decline with an increase in barley, oats and linseed and the maize and sunflower acreages remaining constant.

Deliveries to the Maize Control during the past two crop years ending 31st July were:—

					<i>Bags of 200 lb. net</i>	
					<i>1955/56</i>	<i>1956/57</i>
Non-African areas	..	..	..	..	1,080,556	896,115
African areas	..	..	..	..	651,054	637,905
					1,731,610	1,534,020

Of the 637,905 bags of African-grown maize 422,950 bags came from Nyanza Province and 109,216 bags from Central Province. The 1957 Nyanza surplus is estimated at 656,000 bags.

The guaranteed f.o.r. price for Grade II maize from the 1957 crop was Sh. 39/98 per 200 lb. bag naked. The equivalent price for Grade I wheat was Sh. 52 per 200 lb. bag naked.

Cereals, Other.—Sorghum, Finger millet, Bulrush and Foxtail millets are subsistence crops in the African areas. In the crop year ending 31st July, 1957, 32,814 bags of these cereals were sold to Produce Control, value £57,905.

Chillies.—Good crops were harvested in the Taita District and recorded exports were 182 tons worth £21,500 to producers. Illicit exports were estimated to be an additional 50 tons worth £5,600 to producers. The coastal crop was badly damaged by *Vermicularia capsici* owing to the humid season. The estimated tonnage from this crop is 80 tons value £9,440.

Coffee.—The area planted by European growers is approximately 60,000 acres. Total production from the 1956/57 crop amounted to 18,350 tons compared with the previous crop of 23,919 tons. The crop was valued at £9,760,788. Export figures are in Table B.

Particulars of the expansion of the African-grown crop are given in Table B.

TABLE B.—PARTICULARS OF AFRICAN-GROWN COFFEE AS AT 31-12-57

DISTRICT	Total Planted Acreage	Production in 1957	Value to Grower	No. of Growers	No. of Nurseries	No. of Seedlings in Nurseries	No. of Factories	No. of Co-op. Societies
		<i>Tons</i> <i>Clean Mbuni</i>	£					
ARABICA—								
S. Nyanza ..	2,661	259 245	155,055	8,578	76	430,000	19	25
Elgon Nyanza ..	1,297	87 46	41,172	6,848	12	284,000	10	11
North Nyanza ..	257	9 4	2,200	1,430	8	91,150	1	8
Central Nyanza ..	3	Nil	Nil	49	1	8,000	Nil	Nil
Kericho ..	14½	Nil	Nil	75	2	20,000	Nil	Nil
ROBUSTA COFFEE—								
Elgon Nyanza ..	4	Nil	Nil	40	3	28,000	Nil	2
North Nyanza ..	18	Nil	Nil	172	2	9,000	Nil	1
Central Nyanza ..	18	Nil	Nil	266	1	7,000	Nil	Nil
ARABICA—								
Taita Hills ..	252	12 9	6,488	1,229	1	100,000	1	1
Machakos ..	352	20 2	10,578	1,824	6	90,000	1	5
Meru ..	5,841	767 114	468,000	20,330	29	912,900	30	10
Embu ..	3,118	282 89	157,099	10,165	12	696,000	20	11
Nyeri ..	1,207	85 1	44,648	4,194	10	350,000	5	3
Fort Hall ..	1,138	56½ 10½	32,708	4,777	21	319,390	4	7
Kiambu ..	603	6 8½	3,952	2,013	21	255,000	1	1

The cup presented by the Kenya Coffee Board returned to Meru in 1957 the winners being the Igoji Society. The quality of the crop in Central Province remained high (60 per cent of the Meru crop was in the top three classes) but there was some deterioration in Nyeri and Fort Hall in part due to outbreaks of Coffee Berry Disease.

The Nyanza crop was affected by climatic conditions. Continuous rain in South Nyanza from January to July caused a heavy outbreak of *Hemileia vastatrix*. Outbreaks were also severe in Elgon Nyanza. A shortage of K7 seed has tended to restrict expansion in the lower areas of South Nyanza, North Nyanza and Central Nyanza.

Coco-nuts.—The acreage in the Coast Province is 50,400, made up of 25,700 acres in Kilifi, 22,000 in Kwale, 1,700 in Malindi and 1,000 in Lamu. Approximately three-quarters of this acreage is African grown.

Yields in the better areas on the south coast are 25 to 30 nuts per palm. A high proportion of palms are tapped for toddy and are consequently unproductive of nuts. In parts of Kilifi more than a quarter of the palms are used for tapping. This tapping is an important source of income to Africans, as is illustrated by a tapping area in Kilifi where a gross income per acre of Sh. 578 is made up of 550 raw nuts at 12 cents = Sh. 66, 1.75 frasilas of copra Sh. 20, 350 *makui* (thatch) Sh. 42, 150 gallons of toddy Sh. 450.

Millers purchased 1,869 tons of copra at an average price of Sh. 16/50 per frasila principally from Kaloleni and Digo Districts. In addition 1,063 tons of copra were imported from Tanganyika with 26 tons of coco-nut oil and a further 175 tons of oil from Singapore. Local factories at the Coast also exported 650 tons of coir and a further 191 tons was sold locally.

Cotton.—The final production figures for the 1956 crop which was ginned in 1957 were:—

		Bales of Lint of 400 lb.			
		<i>Acres</i>	<i>AR</i>	<i>BR</i>	<i>Total</i>
Nyanza Province	.. ..	54,000	6,717	520	7,237
Coast Province	.. ..	19,900	360	362	722
		73,900	7,077	882	7,959

Prices paid to growers in cents per lb.:—

				<i>Coast</i>		<i>Nyanza</i>	
				1956/57	1957/58	1956/57	1957/58
AR	..	..	..	54	60	55	57
BR	..	..	..	20	20	20	22

The Coast crop is estimated to yield 2,300 bales and the Nyanza crop 8,200 bales. In all areas of Nyanza Province the standard of cultivation was poor many growers being too lazy to pick cotton when ripe allowing it to fall on the ground and get dirty. It is evident that this crop would die out in Nyanza without the consistent pressure on growers which our staff maintain. Good results were obtained from dusting with BHC and DDT on selected holdings in South and Central Nyanza. At the Coast the Jassid resistant variety UK.51 has replaced the old variety N17. The Coast crop was sold by tender and the Nyanza crop was disposed of through the Uganda Lint Marketing Board. Export figures are in Table C.

Essential Oils.—There are three producers in the Lumbwa District with a total area of 120 acres. Production amounted to 1,127 lb. in 1957 worth £5,354. The price in November was Sh. 150 per lb. (Sh. 86 in 1956). It is difficult to obtain a complete stand of this crop and rooted cuttings in soil blocks are being tried to overcome gappiness. Export figures are in Table C.

Groundnuts.—An export surplus of 26,521 bags worth £103,235 was derived from the 1957 crop in South and Central Nyanza and marketed by the Nyanza Province Marketing Board. Trials are proceeding to establish the crop in Lower Embu and Fort Hall District.

Kapok.—Potentially heavy yields were spoiled by heavy rain at the end of the year in the Coast Province. Production is derived from three plantations and from a scatter of trees along the coastal strip. Figures for 1957 are:—

Malindi	..	..	..	..	..	42 tons valued at £ 925
Kwale	..	..	..	..	..	52½ tons valued at £1,000
						£1,925

Maize.—See Crops, Scheduled.

Passion Fruit.—Production in Nyanza amounted to 3,003 gallons from 38 acres spread over seven growers. "Woodiness" disease continued to attack the crop and "Brown Spot" was also more evident. Total production in 1957 was 91,326 lb.

Pineapples.—Sales of pineapples from the Central Province declined from 7,580 tons in 1956 to 6,445 tons in 1957. In Kiambu, the main producing district, pines could be purchased in the African markets for as little as 5 cents each when the Thika Cannery closed temporarily in the early months of the year. Lack of confidence in the market is now hampering expansion and about half the acreage of this crop in Fort Hall District has been dug up and used for other purposes.

Potatoes.—Production in Central Province was 94,947 bags valued at £100,689 compared with 66,666 bags value £82,004 in 1956. Spraying against "blight" is now general in Nyeri and Fort Hall Districts. 800 acres are grown in Elgeyo where the main varieties are Kerr's Pink, Kinongo and Majestic. Production from the African areas of Rift Valley Province was valued at £37,000. Increased plantings are reported on farms in the Nakuru area and the Kinangop.

Pulses.—Deliveries to Produce Control in the crop year ending 31st July were:—

						1955/6	1956/7
Beans, various	..	..	..	..	..	3,708	4,864
Field peas	..	..	..	..	..	115	120
Cowpeas, grams and others	..	..	..			985	1,439
Totals						4,808	6,423

Recorded sales in Provinces are given in Table D and exports in Table C.

Pyrethrum.—Production of dried flowers was 3,370 tons in 1957. 864 growers are licensed for the pool year ending 31st March, 1958. Acreages in Central Province are:—

							<i>Acres</i>
Meru	..	..	..	..	..	..	25
Embu	..	..	..	..	..	..	120
Nyeri	..	..	..	..	..	..	390
Fort Hall	..	..	..	..	..	..	10
Kiambu	..	..	..	..	..	..	1,533
							2,078

Production from this acreage in 1957 was 268 tons valued at £42,682. Attention is being given to replanting the Kiambu crop to arrest the decline in production. In South Nyanza production increased from 28½ tons worth £4,800 in 1956 to 96 tons valued at £17,760 in 1957. A great improvement in cultural standards in this area resulted in an average yield for the district of 560 lb. of dried flowers per acre giving a return of Sh. 934 per acre.

Rice.—Production in Nyanza rose from 26,616 bags valued at £37,025 in 1956 to 37,498 bags valued at £59,786 in 1957. The campaign to eliminate mixed paddy continued and rice grown is now mostly confined to pure varieties particularly *Shindano* and *Shingo la Majani*. Deliveries to Produce Control totalled 31,300 bags of 160 lb. of paddy value Sh. 33/60 per bag.

Sisal.—Production increased from 39,637 tons in 1956 to 41,080 tons in 1957. Prices again declined during the year. The Machakos African Sisal Scheme functioned at a low level for only part of the year 82 tons worth £4,962 being exported.

Sugar.—Production figures for Kenya factories in 1957 were:—

							<i>Tons</i>
Miwani	..	..	..	..	..	..	17,502
Ramisi	..	..	..	..	..	..	3,320
Total							20,822

The Miwani mills handled 221,494 tons of cane of which 39,840 tons came from individual growers. The price paid for cane delivered at factory was Sh. 38/55 per ton. The Kibos Co-operative Society which ceased to function in 1956 became operative again and marketed 3,056 tons of jaggery for £88,590. The total acreage put under cane by Asian producers in Nyanza is 23,000 acres of which 9,550 acres is mature cane. Production of cane amounted to 252,054 tons in 1957. The Ongeng Jaggery Factory in South Nyanza operated successfully throughout the year and produced 127 tons of jaggery from 1,294 tons of cane. Two more factories are planned at Oyani and Migori in South Nyanza. In North Nyanza growers formed themselves into a Co-operative Society and built a modern jaggery factory.

At Ramisi in Coast Province 7,200 acres are under sugar-cane. A scheme has been started for cane production by neighbouring African peasants.

Tea.—The area under tea in Kenya expanded by 2,952 acres in 1957 to 29,982 acres, producing 22,024,776 lb. of made tea of which 16,727,830 lb. was exported. The total area licensed to be planted to tea at the end of 1957 was 70,570 acres.

In Nyanza the first plantings of African-grown tea were made in the Kimulot area of Kericho District and the Mukomani area of South Nyanza during the long rains. At Kimulot 106 growers planted 35½ acres and at Mukomani 90 growers planted 16 acres. A new nursery was established at Musobeti in the Kisii Highlands and the Kimulot nursery was expanded. The acreage of African-grown tea in Nyanza is 51½ acres spread over 196 growers.

In the Central Province planting of tea continued in Nyeri and Embu Districts but the pace was slowed by land reallocations among the people and the creation of consolidated holdings. Acreage figures are:—

<i>Nyeri—</i>							<i>Acres</i>
Othaya	..	..	..	..	..	..	95.48
Mathira	..	..	..	..	..	..	289.82
<i>Embu—</i>							
Ndia	..	..	..	..	..	..	105.50
Total							490.80

The Ragati Tea Factory started manufacturing tea on 1st July, 1957. Arrangements were made throughout the tea-growing areas where tea was ready to pluck for collection points. A fixed day each week was arranged for collection of leaf from each collection point. Only leaf up to a recognized standard was purchased, i.e. two leaves and a bud. A lorry from the Central Province African-grown Tea Marketing Board with wire baskets visited each collecting centre on the appointed day and the leaf from each producer was weighed and recorded against his name and a receipt issued. On arrival at the factory the leaf was check-weighed and a record in the name of individual producers kept. Payment to the producer was made quarterly. The tea was manufactured by conventional methods and a good quality produced. Production figures for 1957 are:—

Green Leaf Picked	..	..	..	..	59,343 lb.
Value to Growers	..	..	..	..	£1,187
Made Tea Produced	..	..	..	..	12,872 lb.

Tobacco.—Marketing continued through the E.A. Tobacco Company of the crop derived from Kitui, Embu and Fort Hall Districts. Production figures are:—

				<i>Acres Planted</i>	<i>Yield</i>	
				<i>Long & Short Rains</i>	<i>Tons of</i>	<i>Value</i>
				<i>Total</i>	<i>Green Leaf</i>	<i>£</i>
Fort Hall—						
Sagana	..	..	..	154	297	2,744
Embu—						
Sagana	..	..	..	137	299	2,700
Ena	..	..	..	240	424	3,882
Kitui	..	..	..	700	408	3,816
Totals	..			1,231	1,428	13,142

The price to the grower remained at the 8 cents per lb. level.

Vegetables, Fruit and Flowers.—Total sales in the Central Province were:—

							Value £
Flowers—							
219,800 bunches	..	..	..	..	..	..	3,237
Bananas—							
1,537 tons	..	..	..	..	..	..	49,137
Fruit and Vegetables—							
14,334 tons	..	..	..	..	..	..	224,900
Miraa (<i>Catha edulis</i>)—							
78,237 bundles	..	..	..	..	..	..	78,227
						Total	£355,501

Figures for the Southern Province were:—

							£
Fruit—							
1,176 tons	..	..	..	..	..	..	53,658
Vegetables—							
330 tons	..	..	..	..	..	..	22,671
Coriander—							
9,630 lb.	..	..	..	..	..	..	481
						Total	£76,810

Production in the Taita Hills which supplies Mombasa declined to 706 tons compared with 850 tons in 1956. The value of the produce was £15,825. Taita growers are exhibiting a marked disinclination to improve the packing and presentation of their produce for the Mombasa market. The citrus crop is estimated to have yielded 3,500 tons worth £34,000 from the 650 acres grown in the Coast Province. Banana production from the Coast (mainly Malindi), was 2,600 tons worth £35,000.

Bananas continue to be an important cash crop in North Nyanza realizing £25,000 in 1957. The onion crop in Nyanza again declined to 957 bags worth £1,961.

Wattle.—51,533 tons of green and dry bark were purchased from European and African growers.

Comparative figures of production are:—

	1956 Tons	1957 Tons
Total production of extract	25,512	21,421
Total export and local sales of extract ..	22,277½	25,266½
Exportable value (approx.) of extract	£1,353,781	£1,440,156

Wheat.—See Crops, Scheduled.

Livestock Products

Particulars of production from the African areas are given in Table D. Figures for export of these products are given in Table C.

TABLE C.—QUANTITIES AND VALUES OF EXPORTS OF KENYA PRODUCTS, 1957

COMMODITIES	Unit	QUANTITIES					VALUES				
		1939	1954	1955	1956	1957	1939	1954	1955	1956	1957
Cattle ..	Number	—	650	601	831	395	—	33,493	25,740	25,313	12,550
Sheep and Goats ..	"	—	304	167	51	284	—	613	605	224	621
Bacon and Ham ..	cwt.	1,376	14,110	4,837	3,593	11,767	9,080	164,300	70,998	56,770	172,069
Butter ..	"	1,208	1,227	1,381	919	827	5,162	25,985	32,776	25,123	20,329
Butter and Ghee ..	"	21,277	25,764	30,405	38,170	31,080	90,659	483,572	517,646	620,402	506,959
Cheese ..	"	652	132	483	1,166	758	2,987	2,355	6,070	16,994	11,500
Hides (shade dried) ..	"	19,245	48,208	45,505	45,020	82,271	53,372	665,748	457,396	490,037	799,286
Skins (Sheep and goat, shade dried) ..	"	337,082	25,949	28,480	24,200	29,464	18,152	609,005	661,801	514,015	629,844
Hides (sun dried) ..	"	21,737	1,828	1,723	559	233	43,444	16,847	12,070	3,945	1,591
Skins (sheep and goat, sun dried) ..	"	1,014,543	825	542	784	354	40,900	13,348	8,315	4,110	4,321
Other Hides and Skins ..	"	—	10,686	23,989	21,961	408	—	81,343	159,359	153,425	27,819
Wool ..	100 lb.	15,114	12,281	13,818	16,666	16,210	56,578	214,530	256,908	279,616	289,677
CROP PRODUCE											
Coco-nuts and Copra ..	ton	215	52	645	80	102	1,561	1,193	34,865	3,568	2,259
Coffee ..	cwt.	338,125	216,136	388,468	534,214	445,677	800,827	5,726,824	8,926,908	13,674,568	10,812,281
Cotton ..	100 lb.	59,677	61,002	52,249	69,045	31,097	124,021	796,041	691,649	852,474	369,722
Sisal ..	ton	29,163	32,232	33,502	35,205	39,598	442,434	2,041,563	1,958,631	2,075,303	2,078,012
Flax ..	"	16	22	9	—	2	810	3,341	1,296	—	103
Beans and Peas ..	cwt.	123,002	12,873	12,891	5,983	8,635	40,250	38,174	36,784	18,677	23,590
Maize ..	"	1,007,125	918,332	1,543,033	84,706	452,177	222,037	1,013,192	1,665,422	89,403	466,062
Maize Meal and Flour ..	"	122,029	5,602	12,553	479	368	25,430	8,182	17,107	817	714
Pulses other than Beans ..	"	7,756	—	—	—	—	2,702	—	—	—	—
Wheat ..	"	973	—	—	—	—	393	—	—	—	—
Wheat Flour ..	"	63,883	103,169	15,270	1,787	1,668	50,635	269,096	40,697	4,770	4,705
Grain other than Maize and Wheat ..	"	14,618	29,994	18,162	84,484	691	4,424	18,388	29,317	144,074	1,750
Groundnuts ..	ton	402	28	1	1,760	2,039	4,442	1,317	56	107,755	146,172
Cashew Nuts ..	"	32	925	1,094	1,891	1,714	1,812	21,437	49,045	144,162	114,898
Castor Seed ..	"	—	6,267	4,905	3,453	4,325	—	253,190	195,653	206,686	271,733
Sunflower Seed ..	"	—	2,570	1,221	1,272	1,283	3,997	88,925	54,288	46,016	53,759
Coco-nut Oil ..	cwt.	33,152	23	693	1,987	208	2,346	177	3,461	9,821	1,177
Essential Oils ..	"	3,660	619	1,013	730	1,051	4,956	29,896	41,312	29,731	32,687
Groundnut Oils ..	"	6,233	226	—	315	16	680	1,582	—	1,835	120
Sesame Oil ..	"	89,944	136	280	89	171	10,008	872	1,946	565	1,249
Potatoes ..	"	173,046	13,735	16,000	18,120	31,454	29,199	14,410	17,302	18,823	37,420
Pyrethrum ..	"	55,628	23,129	18,553	26,180	34,636	357,170	334,272	284,732	390,183	506,254

TABLE C.—QUANTITIES AND VALUES OF EXPORTS OF KENYA PRODUCTS, 1957—(Contd.)

COMMODITIES	Unit	QUANTITIES				VALUES					
		1939	1954	1955	1956	1957	1939	1954	1955	1956	1957
Sugar ..	cwt.	81,463	1,592	440	311	791	50,308	4,957	1,376	993	2,538
Pineapples ..	100 lb.	—	No figures	—	138,067	115,355	—	—	—	765,631	584,358
Tea ..	cwt.	88,627	96,800	115,572	139,125	143,878	501,732	2,062,654	2,761,151	2,615,677	2,860,612
Wattle Bark ..	"	226,716	135,831	162,713	118,230	83,992	72,846	219,979	265,412	193,438	134,452
Wattle Extract ..	"	131,312	484,085	664,465	436,258	526,296	91,439	1,668,037	2,260,853	1,501,332	1,521,875
Passion Fruit Juice ..	"	22,744	—	—	—	gal. 4,088	6,713	—	—	—	3,253
Pyrethrum Extract ..	"	—	1,483	2,443	2,049	1,537	—	570,775	953,746	810,397	597,300
Other Agricultural Produce ..	"	—	—	—	—	—	54,446	323,628	193,414	281,448	340,717
TOTAL							3,242,495	17,823,241	22,696,097	26,178,121	23,446,278

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM THE AFRICAN AREAS (PARTLY ESTIMATED)

PRODUCE	Unit	NYANZA PROVINCE		CENTRAL PROVINCE		SOUTHERN PROVINCE		COAST PROVINCE	
		Quantity	Value £	Quantity	Value £	Quantity	Value £	Quantity	Value £
Bananas ..	Ton	—	36,000	1,537	49,137	—	—	2,300	31,500
Beeswax ..	36 lb.	—	—	253	1,106	1,316	—	3	20
Cashew Nuts	Lb.	—	—	—	—	—	—	5,281,920	84,888
Cassava ..	125 lb.	1,178	735	—	—	—	—	—	2,040
Chillies ..	Tons	—	—	—	—	—	—	608	41,525
Coffee (Parchment and Mbuni)	Tons	646	198,427	3,097	679,239	25	10,578	21	6,488
Copra ..	Tons	—	—	—	—	—	—	1,100	25,900
Coco-nuts	Number	—	—	—	—	—	—	6,270,000	30,000
Coriander	180 lb.	—	—	—	—	53	481	—	—
Castor Seed	180 lb.	—	—	2,430	6,205	44,163	124,391	5,868	21,226
Cotton Lint	Lb.	9,452,349	249,204	—	—	—	—	1,047,029	167,684
Eggs ..	Number	2,445,552	14,745	732,396	7,618	521,561	4,626	—	—
Charcoal, Fuel, Poles	—	—	—	—	61,537	—	1,140	—	—
Ghee ..	36 lb.	17,648	75,883	—	—	1,862	8,589	—	—
Groundnuts	180 lb.	26,521	103,235	—	—	—	—	—	—
Hides ..	Number	—	241,951	—	—	—	—	—	—
Kapok ..	Lb.	—	—	—	27,424	60,563	50,444	—	—
Maize and Maize Meal	200 lb.	598,485	842,336	154,307	199,049	86,048	125,964	188,000	2,250
Millet and Sorghum	200 lb.	30,902	50,230	15,570	19,972	6,904	8,270	8,360	12,740
Miraa (<i>Catha edulis</i>)	Bundles	—	—	78,227	78,227	—	—	90	167
Potatoes (English)	180 lb.	211	316	94,947	100,689	2,165	2,730	8,788	2,656
Poultry ..	Head	4,395	879	27,329	4,541	120,409	18,668	—	—
Pulses ..	200 lb.	13,215	28,201	74,227	171,392	9,370	17,666	3,860	7,781
Pyrethrum	Tons	96½	17,810	268	42,682	—	—	—	—

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM THE AFRICAN AREAS (PARTLY ESTIMATED)—(Contd.)

PRODUCE	Unit	NYANZA PROVINCE		CENTRAL PROVINCE		SOUTHERN PROVINCE		COAST PROVINCE	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Rice (Paddy)	150 lb.	37,498	£ 59,786	6,000	£ 9,907	—	£ —	21,800	£ 27,000
Pineapples	Tons	—	—	6,445	53,714	—	—	—	—
Sesame	180 lb.	4,876	20,512	—	—	—	—	2,052	8,555
Sisal Leaf	Tons	—	—	—	—	82	4,962	—	—
Sisal Fibre		—	—	—	—	—	—	—	—
Skins	Score	23,462	89,387	25,926	43,335	13,517	47,399	—	33,023
Tobacco, Green	Lb.	—	—	2,284,825	9,326	155,000	3,816	—	—
Tobacco, Native Cured	Lb.	—	—	852,480	33,846	—	—	—	—
Vegetables, Flowers and Fruit	Tons	—	1,961	14,390	230,037	1,506	76,329	1,506	26,075
Wattle Bark	Tons	133	880	23,549	280,212	1,900	23,426	223	3,472
TOTAL VALUE, 1957	..		2,032,478		2,109,195		539,552		534,990
Total Value, 1956	..		1,750,862		2,030,944		397,889		433,985

PART II—RESEARCH AND SPECIALIST SERVICES

The Research Division of the Department continued to expand in 1957. Notable developments took place in several directions.

The Grassland Research Team has now its full complement of Pasture Research Officers and four sub-stations operating in addition to the main Kitale Station.

Proposals for expanding the scope of research on coffee were approved by the Coffee Board of Kenya, which had previously reached agreement with Government about the financing of the first phase of an expansion programme. The expansion comprises chiefly an increase in field and laboratory staff and the establishment of a new sub-station in Kiambu. Development of two small research stations to serve the African areas was started at Kisii and Meru.

The Plant Breeding Service is undergoing considerable expansion. A large new laboratory is under construction at Njoro, and 200 acres of land adjoining the station were acquired. The wheat-breeding programme at Njoro has been reorganized and expanded, and a new plant-breeding programme is getting under way at Machakos. The Cereals Producers Board is taking a keen interest and has levied a cess on wheat to provide financial assistance for cereal research.

Elsewhere steady development took place on numerous stations and sub-stations. This included initial development on the newly acquired Tree Crops Station at Mtwapa in Coast Province. At the Investigation Research Station, Mwea, further experimental land was developed, enabling a comprehensive rice research programme to be started. At Kitale, the Experimental Station was farm-planned and the experimental work intensified. The emphasis at the Sotik Station shifted to grassland work. At Hola, research into the agricultural problems of that area was greatly expanded.

Sisal research came under discussion during the year and agreement regarding future work was reached with the Sisal Board. The Sisal Research Advisory Committee was reconstituted and a Pyrethrum Technical Consultative Committee was formed.

General Husbandry

AFRICAN AREAS

Grassland.—Much of the work recorded under the main "Grassland" section later in the report is of direct benefit to the African areas. In addition, however, grassland investigations were continued at various general stations with the object of finding suitable grasses and legumes for the various ecological zones, and the best methods of establishment and management of leys. The 1957 results generally confirmed previous findings.

Fertilizers and Manures.—The 1956 trials in African areas were analysed statistically and it became part of Departmental policy in 1957 to advocate the use of fertilizers on soils which the results had shown to be economically responsive. Applications of farmyard manure, phosphate on highly coloured soils, and nitrogen, particularly on pallid soils, but seldom potash, were found economically beneficial. On certain very acid soils liming was found essential if any crop was to be obtained. Where fertilizers and manures are worth using, potatoes and cereals were found better crops to treat than legumes. The programme was continued in 1957, with about the same number of trials as in 1956. In some, residual responses were studied, whilst others were extended to liming rates. Potatoes received particular attention for this was the crop which responded best in 1956.

Food Crop Improvement.—Much of the work on food crops, of direct application to the African areas, is reported later under various heads. Important projects in this category include the plant-breeding programme in Southern Province, where work is being done on maize, sorghum and millet, and the maize-breeding programme at the Coast where the aim is to produce resistance to *Puccinia polysora*. The work being done on the irrigation schemes, particularly on rice, is worth particular mention, too.

A variety collection of 177 sorghum types was maintained in Nyanza Province. In a trial in that area, two varieties of Dobbs sorghum out-yielded imported white-grained varieties from the Sudan. Trials in Nyanza and elsewhere have shown that many of the newer varieties are highly productive, but the necessity to provide protection against grain-eating birds remains the chief drawback to the crop. In a trial in Southern Province with the common millet, *Panicum milliaceum*, broadcasting produced better yields than drilling. Drilling in rows 9 inches apart produced better yields than drilling in wider rows. In a rice trial, under hanging swamp conditions, in Nyanza Province, three varieties were tried, both broadcast and spaced. Sindano gave a good yield at 17 bags per acre. Spacing at 12 inches $\times$ 9 inches was found to result in better yields than broadcasting seed at 150 lb. per acre.

There was a cassava variety trial at the Coast which included the most promising varieties from the many tested to date. The variety 46106/27 reaffirmed its position, out-yielding the next best variety by nine tons of roots per acre as against seven. A preliminary trial of recent releases from Amani has shown them to be very promising in resistance to mosaic and brown streak. A further trial of 25 cassava varieties, not yet released, has been undertaken, following the run-down of breeding work at Amani. The blight-resistant variety of potato, C.53, yielded nearly seven tons per acre in a trial with two other types at Kakamega, although it was severely attacked by early blight. Similar work at Kisii was brought to a standstill by heavy infection with *Pseudomonas solanacearum*. The majority of the crop from the Kakamega trial was sold as seed to progressive African farmers. Elsewhere much information on the manuring of the potato crop has been accumulated through the programme of fertilizer trials in African areas.

Cash Crops.—Cotton trials in Coast Province demonstrated the superiority of the UK.51 variety to the others tried, including UK.55. Both UK. 51 and U.K.55 showed very satisfactory resistance to Jassid damage. There was no increase in the crop through growing cotton on various sizes of tied ridges as against growing it on the flat. This season less marked differences in yield than last year were obtained from early and late-planted cotton, but the same trend in favour of reasonably early planting was to be observed. The residual effect of mulch applied in 1956 did not influence the yield of cotton, but seriously depressed the quality of the crop as was the case with the original mulch last season. Spacing at 3 feet $\times$ 1 foot 6 inches produced a yield of 18 per cent more than a 3 feet $\times$ 3 feet spacing. In both cases, the crop had been thinned to two plants per hill. Work on the control of pests on cotton both in the Coast and Nyanza Provinces is recorded later.

Observation plots of castor oil varieties were established at various stations in 1957. The main object was to study the local varieties. Interesting results include a yield of 1,540 lb. per acre at one centre in Coast Province, from a large seeded local variety. A trend of increasing yield from the wetter to the progressively drier districts has appeared. Trials with hybrid castors have not been promising. The non-shattering variety UC.53 yielded well in a trial sited on volcanic soil at the Coast. Elsewhere it performed poorly.

Other cash crops for the African areas on which work was undertaken during the year, and which is not referred to elsewhere, included trials on tobacco, pyrethrum, tea and pineapples. Particular mention is made of the jute substitute crop, *Hibiscus cannabinus*, which, in addition to its trial under irrigation at Mwea and Perkerra, was tried as a rain-fed crop in Nyanza Province. A great deal of valuable information about this new crop has been obtained in these areas with the ready assistance of Messrs. East African Bag and Cordage Company Limited, who have carried out the factory tests.

Bracken Zone.—Work in this zone of Central Province continues. Good residual effects of manure and double superphosphate, applied to potatoes in the preceding long rains, showed up in a crop of Lampton oats cut for silage. Good responses to reapplied manure and superphosphate were obtained in a crop of Dutch Robyjin potatoes, but the expected effect of liming has not yet appeared. In a trial on established Kikuyu grass, sulphate of ammonia, double superphosphate, lime and manure increased productivity very markedly. The phosphate treatment encouraged the growth and production of self-sown Kenya White clover.

Rotations.—In a rotational trial at Embu, maize following sweet potatoes out-yielded maize following English potatoes which, in turn, significantly out-yielded maize following maize. Thus a strong argument against successive maize crops is provided. The improvement in fertility induced in exhausted sandy coastal soils by a one, two or three years' rest under pigeon peas was evident in 1956, but had apparently disappeared in 1957. Resting this soil under a grass cover for the same periods produced negligible benefits in either year.

EUROPEAN AREAS

Drainage.—The Londiani mole draining trial has been completed and has shown that mole draining is effective on vlei land for the length of a 7/8 year rotation. The moles which should be put in before breaking the grass ley in the rotation, gave a significant increase over the unmole plots of 0.83 bags of wheat per acre over the six years the trial was down. The mole draining versus tile draining trials at Ol Joro Orok have continued. They show that a combination of moles and tiles give the best yields of wheat. Work on the Kinangop concerns the control of surface water flow and sub-surface drainage. The possibility of manufacturing low-cost pumice-cement drainage tiles is also being explored.

Fertilizers.—The trial to test the residual and cumulative effects of three forms of phosphate begun in 1952 continued at Eldoret. Growth was better than in the previous year and all three forms of phosphate appear still to have an appreciable residual effect. A phosphate residual trial on wheat at South Kinangop compared seven forms of phosphate at equivalent rates of P_2O_5 , and showed that there are great differences in response. In brief, Uganda Rock and North African Rock were only a little better than control while basic slag, though better than the previous two, cannot be recommended for wheat. Single supers, double supers at high and low levels, and soda phosphate all gave a good response and the plants tillered well. The liming trials which continued at various stations in the Province are reported later under the heading Soil and Agricultural Chemistry. The Eldoret farmyard manure trial showed pig manure at 10 tons per acre to have an outstanding effect, giving 19.5 bags of maize per acre, compared with 14.6 bags per acre from 200 lb. double supers, and 13.2 bags per acre from the control. All forms of farmyard manure were superior to double supers.

Silage and Fodder.—At Ol Joro Orok it was found impossible to ensile rape due to difficulties in getting the crop to heat sufficiently. Eldoret figures again showed that maize and oat crops for silage yielded more when legumes are

present. Fodder beet again did well at Ol Joro Orok, and English Giant rape yielded 18.4 tons per acre despite having suffered during previous droughts. Work on the Kinangop, comparing six types of fodder crops at different rates of phosphatic dressings, has given information on yields. The range is from 8.5 tons per acre with lightish dressings of phosphate to 14.8 tons of green material per acre with heavier dressings. It was also shown that Marrowstem kale, Thousand-headed kale, and Drumhead cabbage were more drought-resistant under Kinangop conditions. The best fertilizer dressings were 200 lb. per acre triple supers and 150 lb. per acre of sulphate of ammonia.

Grasses and Legumes.—Grass varietal and establishment trials have been continued in all districts and noteworthy were Naro Moru (best: Nandi *Setaria*, Star), Timau (best: Nandi *Setaria*, Rhodes), and Mweiga (best: Nandi *Setaria*, Rhodes). On the Kinangop Westernwolths ryegrass and Louisiana white clover are the most promising species. It might well be that Cocksfoot, Timothy and *Phalaris tuberosa* will have to be treated as row crops. At Ol Joro Orok it appears that wheat is a better cover for a ley than oats if both are to be taken for grain. At Eldoret grass directly sown gave a better sward than grass undersown to wheat in seven-inch and 14-inch rows. Rolling the seed bed benefited the grass establishment but depressed the wheat yields. Legumes still remain the main problem in all areas. Much experimental work has been directed on this problem.

ANIMAL HUSBANDRY

Beef.—The first stage of the Ol Joro Orok beef experiment comparing Hereford $\times$ Boran, Aberdeen Angus $\times$ Boran, and Boran steers has been completed and from the results the following points are clear:—

- (1) Except for the two Aberdeen Angus $\times$ Boran steers, which were finished for the Fat Stock Show, killing-out percentage was fairly constant and independent of the cross.
- (2) Pure Boran dead weights were lower than for both crosses.
- (3) The Hereford crosses gave, on average, heavier carcasses than did the Angus crosses, which were one month older at slaughter.
- (4) The proportion of fore- to hind-quarters was approximately the same for all crosses.
- (5) From the few carcass measurements made, the only conclusions reached were that pure Boran were fatter at slaughter than either cross.
- (6) It is clear that the experiment should be carried through to produced finished beasts, to determine the full potentialities of the cross.
- (7) A single implantation with 60 mgm. of Hexoestrol has little or no effect on rate of live-weight gain or killing-out percentage.

The beef experiment at Eldoret has given unusual results. This trial consisted of carrying one group of four yearling Red Poll steers through the rainy and dry seasons on grass alone whilst another group was fed supplementary oat silage at the rate of 35 lb. per head per day during the dry season. The silage group continued to put on steady gains throughout the dry season, but these gains levelled off from the advent of heavy rain until dry weather returned, when gains again became apparent. The grass-alone group put on parallel gains during the dry season, but with the onset of heavy rains showed heavy live-weight losses. Taken overall the trial was surprising in that the non-supplemented group tended to show better live-weight gains throughout the rainy season than the group receiving silage during the dry weather. This finding will require further investigations.

Milk.—Work is continuing in an attempt to evaluate leys in terms of milk production and the Ol Joro Orok station especially is gaining useful information.

Pigs.—Pig trials have been concerned mainly with comparisons between indoor and outdoor housing and *ad lib* versus controlled feeding. Costings and conversion ratios have been calculated. At Eldoret two phases of the trial have been completed and the results show that conversion ratios are better for pigs kept outdoors on controlled feeding and that it is best to rear the pigs outdoors to 150 lb. live-weight and then finish them indoors. The results from the two first phases are conflicting and a third phase will attempt to confirm the previous findings. Ol Joro Orok figures are interesting in that indoor and outdoor housing systems compare closely with each other provided the outside houses are properly insulated against day and night temperature fluctuations of more than about 12 degrees. Kitale results favour outside housing systems, but further work is needed to really confirm this.

Sheep.—At Eldoret, studies are going on on a Hampshire ram cross native ewes and some promising half-bred lambs have been produced. It would appear that adequate nutrition is the limiting factor to successful lamb or mutton production on the Plateau and methods of remedying this state of affairs are being investigated. At Ol Joro Orok sheep work is mainly concerned with increasing flock numbers and twice a year lambing is being introduced. Other studies concern the effects of castration, flushing and the use of rape and concentrates for finishing. The aim is Highland mutton and one wool clip.

Poultry.—Eldoret is the only station doing work with poultry. Comparisons of deep litter versus free-range systems have been made and the results are almost ready for publication. Indications are that there is little between the two systems in terms of egg production but that the deep litter system is more convenient in terms of labour and operator comfort.

Grassland

Kitale.—The plant introductions of special interest mentioned last year, namely Sainfoin, Giant *Setaria*, Ronpha grass and *Phalaris daviesii*, continue to show promise. New plantings this year include many varieties of Rhodes grass, Star grass, Guinea grass and Elephant grass. In particular it is hoped that some good seeding varieties of Star grass will be found among these introductions. Further varieties of subterranean clover have been obtained from Australia, and also a good variety of Red clover from the United States of America. *Hedysarum coronarium* (Sulla), a perennial from Italy, also seems well worth further trial.

The preliminary grazing trials, including some new introductions, continued in 1957. In these trials, Kenya White clover, Louisiana White clover, Hairy Peruvian lucerne, *Desmodium uncinatum*, Rueppell's clover and the Yarloop and Dwalganup varieties of subterranean clover persisted and showed up well.

The beneficial influence of gypsum, presumably by supplying additional sulphur, continues to show up clearly in our mixed grass-legume swards at Kitale and other places nearby.

The management of mixed grass-legume pastures is very important. Experiments show that white clover dominance is encouraged by close mowing and frequent grazing, and that this balance may be reversed by grazing at sufficiently long intervals to allow the grass to make adequate growth, with the avoidance of close mowing.

A series of fertilizer experiments on lucerne shows that half a hundredweight per acre of triple superphosphate gives as good a result in the establishment year as larger amounts. A comparison of forms of phosphate has shown that basic slag and soda phosphate have given significantly higher yields with lucerne than triple superphosphate. The mineral impurities in these two fertilizers may be partly responsible for the effect.

In an experiment to compare the effects of calcium alone, sulphur alone, calcium plus sulphur, and gypsum, the two latter treatments have given the best results to date. The object was to see if anything other than sulphur in the gypsum is influencing the growth of legumes. Investigations to find out what fertilizers, other than triple superphosphate, and what trace elements, if any, might be required by legumes to increase their ability to fix nitrogen were generally inconclusive, as were those to test the effect of magnesium, boron and zinc on legumes.

The animal agronomy work, designed to compare species and strains, management and manuring, by means of meat and milk production, has now started. An experiment to compare a grass-clover ley, treated with and without fertilizer, and another to compare a grass ley with a grass-clover ley are now in progress. A urea spraying trial on natural grassland indicated that this method of improving rough grazing was expensive and wasteful, and that the quality of the herbage was not markedly improved.

Kitale station now possesses over 30 pairs of monozygous and dizygous cattle twins, mainly females. These will help very considerably in future experiments where animals are used.

Seed production investigations have as yet found no control for Bunt and Ergot on *Setaria* and *Panicum*. Rhodes grass strains, Nandi *Setaria*, Guinea grass, Molasses grass, Kenya White clover and lucerne are being bulked by a local seed growers' organization. Other grasses and legumes which have proved themselves in experiments, are being multiplied on the station for further trials.

The co-operative experiments programme has revealed legume response to gypsum on Central Cherangani farms and on farms in a line from there through to Hoey's Bridge, to the Lugari District, and in one instance on Mount Elgon near the Suam River. No responses have been obtained from the soils of Endebess, Soy, Eldoret or Ainabkoi. This programme has also shown that subterranean clover grows well on soils cleared from forest in the Cherangani Hills.

Chemistry.—The Pasture Research Chemist investigated the effect of removing fats before carrying out an acid-fibre estimation, and the use of 5 per cent hydrochloric acid as against 1.5 normal sulphuric acid as the solvent for this determination. The crude protein remaining in the fibrous residue after digestion was examined in relation to the crude protein contained in the original plant material.

The usefulness of the Wedemeyer technique for the artificial digestion of feeding-stuffs was investigated in the light of the recently published equation of Glover and French (*J. Agric. Sci.*, Vol. 49, 1957), from which average estimates of protein digestibility in feeding-stuffs can be obtained from a knowledge of their crude protein and their crude fibre contents.

For legumes, fodder trees and shrubs, grasses at a specific stage of growth, and grasses in advancing stages of maturity, relationships which connect the crude protein contained in their dry matter and their total carbohydrate were worked out.

In two experiments designed to study the phosphate requirements of grazed Star grass pasture at Kitale and Muguga, now in their second year, some treatment differences are beginning to show up.

Molo Sub-Station.—At this sub-station, experiments reflect the change-over to grazing management trials. Considerable live-weight increases in lambs were obtained from the use of fertilizer nitrogen, but further work is necessary before recommendations can be made. Other work confirms last season's results that yields of grass in the second year are very low if nitrogenous fertilizer is not applied. There was no difference between the responses to sulphate of ammonia and the N.A.C. nitrogenous fertilizer, but urea on an equivalent nitrogen basis was 15 per cent less effective. However, economy in transport charges may well offset this difference.

Subterranean clover in grass leys shows promise. It is likely that about 7 lb. an acre should be the minimum rate sown. This means that the grass seed rates (which are often unnecessarily high) should be reduced, otherwise ley mixtures will be too expensive.

Katumani Sub-Station.—The development of the Experimental Farm has been the main preoccupation during 1957. A full programme of experiments was started in October, but until then work was mainly confined to supervision of the Makaveti Experiment and the introduction of species and strains which are suitable for leys and fodder.

Work on grasses for sown leys has shown Rhodes grass, *Cenchrus ciliaris*, *Cenchrus setigerus*, *Eragrostis superba* and *Bothriochloa insculpta* to be the most promising. The Makaveti Experiment showed that Rhodes grass lacked persistence, and that the mixture of *Cenchrus* and *Eragrostis*, though very persistent, was sometimes coarse. More persistent strains of Rhodes and more leafy strains of *Cenchrus* and *Eragrostis* are therefore being sought. The only legumes which have shown much promise are *Clitoria ternatea* and *Indigofera subulata*.

On fodder crops, the Makaveti Experiment showed that if a reserve of fodder is available from August to November, grassland will carry as much as one beast on two acres in a good year. Work on the management of natural grassland has also been started.

Kamasia Sub-Station.—This sub-station is intended to serve the semi-arid African areas of the Rift Valley Province. A programme of experimental and survey work has been initiated.

Vegetation surveys have taken two forms; the extensive survey, purely ecological, aimed at producing a reasonably accurate map for each district, and the intensive survey of an area of particular interest, done as a prelude to the introduction of agricultural schemes. To date, four areas within Baringo have been covered intensively and maps and reports prepared.

Experiments have been started in Baringo on methods of reseeding denuded land and on the control of mixed *Acacia-Tarconanthus* bush. In West Suk another experiment on bush control has been initiated, whilst work has also been started within the several grazing schemes that are being introduced into the drier African areas.

In addition, an observational trial has been laid down within the Perkerra Irrigation Scheme to determine which grasses and legumes are most suited for growth under irrigation in the area.

Ranch Survey.—A survey of the European ranching areas of the Kenya Highlands is being carried out by the Pasture Research Officer at Ol Joro Orok.

Notes have been made on the management, the stocking, and the production on each of the many properties visited. To date the survey has revealed that the general standard of development and of management can be improved, that severe over-grazing is present only in a few isolated instances, but that there are large areas which are slightly over-grazed. Bush presents the largest single problem. An excellent picture of conditions of management in the ranching areas is being obtained.

The Pasture Research Officer at Ol Joro Orok is also undertaking a bush control trial, involving spraying with 2-4-5,T and cutting, in co-operation with the Agricultural Officer (Expts.), Ol Joro Orok. In conjunction with the Pasture Research Chemist, the composition and nutritive value of the grasses *Pennisetum stramineum* and *Themeda triandra* are being studied.

Coffee

Entomology.—Research on the control of *Antestia*, *Antestiopsis lineaticollis* Stal, demonstrated the value of Malathion against this insect. Two pints of the 50 per cent emulsion concentrate applied per acre with the machines commonly used in coffee gave satisfactory control. When spraying had to be done by hand, one pint in 40 gallons of water was the recommended concentration of Malathion.

Outbreaks of leafminers, *Leucoptera* spp., occurred towards the end of the year. Experiments on control of leafminer demonstrated the value of Malathion against the moths and Diazinon against both moths and larvae in the leaves. Two sprays, with eight to ten days' interval between them, against either moths or larvae were found adequate to control an outbreak. The choice of insecticide could be varied according to whether moths or larvae were predominant in the field. Thus Malathion or Diazinon could be used to eliminate the moths, followed by a Diazinon spray to eliminate the larvae from eggs unaffected by the first spray application.

Field experimentation, using Dieldrin bands against White Stem Borer, *Anthores leuconotus* Pasc, confirmed the value of this method of control. Three applications of $\frac{1}{2}$ per cent Dieldrin bands were found adequate to eliminate the borer population from the block used for the experiment. The bands were applied prior to the onset of three consecutive rains.

Chemistry.—Early field results with nitrogen and mulch combinations indicate the likelihood that the maximum application of nitrogen in mature coffee should be split during the long rains. It appears that one-half should be applied during the first third of a normal period, i.e. in the first week in April, and the full dressing completed by application of the second half early in the last part of the rains, i.e. in mid-May.

Growth data in the presence and absence of added nitrogen can be related to actual nitrate nitrogen trends in the soil during the rains, particularly with the low values found towards the end of the rains. Laboratory incubation, under standard conditions, of wet soil samples, taken at the end of the rains period, suggest that low nitrate nitrogen values are not only related to rapid leaching from the upper soil profile and to uptake by the coffee crop, but also to an inability of the soil to produce large quantities. Apparently the nitrogen mineralization process slows down considerably following a sustained period of adequate soil moisture. Easily assimilable organic matter might be less readily available towards the end of a long rains period and may account for this condition.

Further laboratory studies to investigate the influence of pre-drying the soil sample, in preparation for incubation, upon its performance under standard conditions, have pointed to a second mechanism which results, directly or indirectly, in large increases of ammonia nitrogen. This, in turn, is rapidly nitrified when the soil is remoistened.

Topsoil temperature of 45–55 degrees C. are often recorded in the field during the hot dry months of January and February; pre-drying soil samples overnight in an air oven temperature of 50–55 degrees C. has consistently resulted in very high ammonia nitrogen values eight days after rewetting the samples.

Under field conditions, the first mechanism of ammonia accumulation comes into operation as soon as the soil moisture level falls much below the permanent wilting percentage (Robinson, *J. Agric. Sci.*, 1957, 49, 100). This effect has been found to a depth of 24 inches under field conditions. Subsequently, following the short rains season and particularly when the topsoil has dried out, soil temperatures are high and this partial sterilization effect, which in some manner results in releases of readily assimilable organic nitrogen, is operative. Both these mechanisms would appear to be related to the large nitrate nitrogen flush that occurs when sufficient rainfall is received to wet the soil adequately, usually in the following grass rains or early long rains after such a dry, hot period.

Pathology and Physiology.—Work this year has largely been devoted to problems of leaf rust (*Hemileia vastatrix*) control. The studies on physiologic races, commenced last year, have been continued. The main problem has been the determination of the causes of rust attacks on K.7. In one group of cases, segregation of susceptible types was the cause, whilst another group was attacked by D'Oliveira's Rust Race I. Field observations suggest that although this latter is likely to be a serious menace to coffee growing in the lower areas of Nyanza and probably eventually elsewhere, K.7 still remains less affected by rust attack than other varieties and may continue to be of value until satisfactory varieties resistant to Races I, II and III are available. Further, apparently the susceptibility of K.7 to Race I varies with climate. This may be the reason it has remained free of attack in certain areas.

Studies of the factors influencing germination and penetration have been carried out. In confirmation of the findings of earlier workers it was found that spore germination is strongly inhibited by light and that a water film is essential. Germination takes about three hours at 23 degrees C. and penetration commences after seven hours. In the field, it is thus apparent that the leaves must be wet from not later than 10 p.m. for penetration to occur, and this was confirmed in inoculation experiments on trees growing in the open.

An experiment has confirmed that spores are only likely to land on the upper surfaces of leaves and that they reach the under-surface by rain washing and splashing. It was found that during this process, sufficient copper may be picked up from copper fungicide deposits on the upper surface of leaves to inhibit spore germination when these droplets are splashed on to the under-surface.

Tests of two sprays expected to have some effect on rust development after infection did not give encouraging results.

A field trial was carried out with various fungicide sprays applied just prior to the long rains. Magadi Ash Burgundy was used at $\frac{1}{4}$, $\frac{1}{2}$, 1 and 2 per cent, and Perenox at the same copper contents, each being contrasted for application to upper surface as against lower surface of the leaf. Tests of Captan, Fermate and Oleocuvire were included at the $\frac{1}{2}$ per cent concentration only. The results indicate that considerably enhanced control is obtainable by the higher concentrations of

Perenox and Burgundy and that these are effective also on the upper surface of the leaf. Captan, Fermate and Oleocuvire produced about the same control as $\frac{1}{2}$ per cent Burgundy. Further trials have been started.

No additional work on "tonic" spraying has been initiated. The trial of copper and non-copper and hormone spraying and copper dusting received its final spray applications. Hormone spraying again produced little, if any, decrease in leaf-fall, whereas Fernide has been very effective. A rust recording suggested that the treatments in which a good control of leaf-fall had been obtained, were heavier in rust infection.

Investigations of improved methods for assessing cover produced by spraying machines have been carried out and tests were commenced on the "Conomist" spraying machine of Kent Engineering and Foundry Limited. Messrs. Yeo and Coutts, of the Colonial Pesticides Research Unit, carried out droplet size spectrum determinations on a number of spraying machines at the station early in the year.

In the growth-recording blocks, as in 1956, the frequent heavy showers in February and March caused the trees to start growing very early and a peak was reached before the long rains proper commenced both at the Coffee Research Station and at the Scott Agricultural Laboratories. At the former, as might have been expected, irrigation has had little effect, but shading has considerably increased the growth rate, without affecting the general pattern of the growth curves. Records of numbers of growing points and of flowering have been commenced.

The number of routine queries from estates has increased and the number of cases of leaf scorch from the use of various agricultural chemicals is noteworthy.

Coffee Berry Disease.—Results from the time and frequency of spraying trials, using Phenyl Mercuric Acetate were worked out during the year. In Upper Kiambu, flowering is the most critical period, 20-30 per cent increases being obtained from one well-timed blossom application. No subsequent treatments gave any significant results. In the Nyeri District, July and August sprays increased yield by 20 per cent (2 cwt. parchment per acre). In the West Rift conditions again seem different as there appear to be two periods when spraying is required in that locality. At Kapsabet, valuable responses were given by a variety trial varying from 64 per cent increase in SL. 28 to 260 per cent in SL. 30.

Based on these results, a more critical programme was laid down for 1957-58 and the results are now coming in. These confirm the indications given above, the responses this year being considerably higher. Those from the Kapsabet trials, for example, have doubled or, in some cases, trebled. It is now clear that the Blue Mountain variety, though its fruit is resistant is subject to severe flower loss from Coffee Berry Disease.

Towards the end of the year, the first signs of a phyto-toxic effect of mercury sprays were observed, first as a delayed scorch, but later developing into growth abnormalities, associated with low values of zinc, in the new shoots. Work is now in progress on this, but it is already evident that these effects are not so marked when insoluble compounds of mercury are used.

A study of the effect of fungicides on fungal growth, infection, germination and so on has been undertaken with a view to obtaining a reasonably accurate assessment of the value of a given preparation. Very great technical difficulties

were encountered, but eventually a method which seems adequate was developed. All fungicides now under test have been screened in this manner and new ones listed as they become available. One, of outstanding performance under laboratory conditions, is now being tested under field conditions.

In addition to the research work outlined above, observation of many plantations, mainly at the request of their owners, has been made and routine diagnoses carried out.

Vegetative Propagation.—The best results were obtained from wedge-shaped nodal cuttings of two nodes length, prepared from semi-mature wood. On the average, rooting exceeded 90 per cent after three months. Many other types of cuttings were tested but the results were inferior.

Experiments with air layering were disappointing; only a very small percentage of layers produced roots and establishment of these plants was difficult.

A vinyl resin (VL 600) was sprayed on to the leaves of coffee cuttings at the time of insertion so as to restrict losses due to transpiration. Although the rooting percentage of cuttings treated with vinyl resin was not greater than the control, the time taken for rooting was reduced by approximately two to three weeks.

Field Trials.—The 1957 yields from the various trials on the Coffee Research Station have done little but extend and generally confirm results already reported.

Important new trials have been initiated to study the effect on coffee yield of irrigation, various methods of multiple stem pruning, and the integration of various proven good practices such as mulching, clean-weeding, anti-leaf-fall spray and the use of a nitrogenous fertilizer. Two new manurial trials have been laid down to enable a detailed study to be made of the part that magnesium has to play in the nutrition of the coffee tree.

Several rotary-hoes modified for use in coffee, have been tested and in collaboration with the Plant Physiologist/Pathologist and the Colonial Pesticides Research Unit of Arusha, a number of tractor-drawn sprayers have been examined in some detail with a view to determining what characteristics are essential in a sprayer to be used in a coffee plantation.

Variety Trials in African Areas.—Valuable information has been obtained from the large coffee variety trials in the Meru, Embu, Kisii (South Nyanza) and Taita Districts. Numerous observations have also been made on the performance of coffee varieties in the miniature variety trials planted in African areas.

In Meru District, the results of three years' recording has shown that the varieties SL. 28 and SL. 34 have out-yielded consistently the variety Meru Kents.

An inspection was made of all coffee variety trials in Nyanza Province to ascertain the amount of resistance shown by various coffee varieties to leaf rust. The resistance exhibited by the variety K.7 has been outstanding. In Fort Hall District, the variety SL. 6 has shown resistance.

Pyrethrum

Breeding.—Altogether 560 new single plant selections were made on the various stations and a total of 771 were under observation. Promising clones from the 1954 selections were bulked up. At Londiani 11 clones were multiplied under irrigation and will be used as material for seed production in the coming season. Over 2,000 lb. of seed was supplied to the Pyrethrum Board for distribution to growers. In isolation plots, 32 new hybrids were made and 12 large plots established for the continuation of the "sugar beet" breeding systems in 1956, were kept up. New varieties were tested for yield under varying climatic conditions.

Pests and Diseases.—The incidence of *Ramularia* Bud Disease was comparatively light but loss of buds through physiological causes was frequently observed. A heavy thrips infestation did not diminish with the rains and was still a serious problem in certain areas by the end of the season. The results of the control measures are reported later by the Entomologist.

Weedkillers.—Five hormone and nine chemical weedkillers were tested on established pyrethrum as well as on cultivated land prior to planting. Results, as a whole, were disappointing, but further work is planned.

Stripping Trials.—In two trials at Ol Joro Orok stripping down clone 24 to buds had no detrimental effect on yield, but this was not the case with clone 194. This conforms with previous results from Molo.

Fertilizer Trials.—Responses to phosphorus were recorded on many of the more acid soils with a comparatively low base exchange capacity. An application of 150 lb. per acre triple superphosphate at planting time increased the yield by about 200 lb. per acre dry flowers in the third year in a trial on the Grassland Station, Molo, while the total gain over three seasons exceeded 500 lb. Higher applications than 150 lb. per acre gave no additional increase. No difference in efficacy between superphosphate and basic slag was recorded. Molybdenum and zinc produced no response in a trial on the Grassland Station, but five tons per acre lime increased the flower yield by more than 300 lb. per acre. Ridge planting gave yield increases in several cases whilst mulch, applied between the rows of plants only, produced a yield increase of about 120 lb. per acre in Subukia.

Irrigation Trial.—This experiment which had given disappointing results in 1955 and 1956, was planted up again in April, 1957. The rains during the season were rather erratic and failed completely in September and October. Irrigated plots yielded about 250 lb. per acre dry flowers more than the controls, but it is questionable whether a continuous flush can be maintained through the dry season by irrigation alone.

Sisal

Nurseries and Planting Materials.—The first irrigated nursery trial, planted in November, 1956, was lifted after one year. Sisal waste applied before planting bulbils had increased the weight of the plants from 1.68 lb. to 1.95 lb. Application of urea only three weeks after planting increased the weight of the plants from 1.73 lb. to 1.91 lb. It is judged from other results that an application six months after planting would have had a greater effect. The equivalent of five inches of rain added during the last three months produced negligible results probably because the irrigation was done too late. The object of obtaining a large nursery plant for transplanting within one year was not attained, but another attempt will be made with modified treatments.

Plant Management.—The five external spacing and cutting trials have added little new information during the year and will not add more till poling becomes more general in the high population plots.

Fertilizers.—There is little to add to the results of the fertilizer trials reported on last year. The biggest responses obtained in these trials have in all cases been due to applications of sisal waste and/or to sulphate of ammonia. Observations of plants growing for one year in sand cultures, with nutrients added, indicated the effects of deficiencies. Where a full application was made, the 35 leaves grown during one year was about the same as for the application minus calcium or minus potash. The absence of sulphur or phosphate reduced the leaf count by about six/seven, the absence of magnesium by about 13, while in the absence of nitrogen the plants produced no more leaves than the 15 grown on plants living on water.

No conclusive results are yet available from the new series of fertilizer trials planted in 1953/54. A new trial was planted in March, 1957, at Donyo Sabuk, on a heavy clay soil. The treatments included sisal waste applications at planting, after 18 and 36 months, each at 50 tons per acre, gypsum at two tons per acre applied before planting, and a nitrogen application after 18 months.

Weedkillers.—In work on couch grass control Dowpon produced promising results, but it is too early to draw final conclusions. Trials to find a control for broad-leaved weeds in sisal have also given promising results. 2,4-D ester and 2,4-D amine, at 1 lb. acid equivalent per acre, gave the best results. However, where the greatest control of broad-leaved weeds was achieved, there is now the greatest cover of grass. A nursery trial produced similar results. Variations between 0.75 lb. and 1.5 lb. acid equivalent per acre did not markedly affect control. The bulbils were not damaged.

Sugar Cane

A variety trial sited on the upper red soil at Miwani has been completed after its second ratoon crop. In yield of cane and sucrose per acre, CO. 331 was superior to the other varieties tried. A large trial of 25 varieties grown under irrigation at Miwani showed that yields can be raised very considerably by this technique. CO. 419 yielded 77 tons of cane and 9.98 tons of sucrose per acre in its plant crop. Some of the high sucrose Barbados varieties showed equal promise under irrigation.

Horticulture

Marketing.—Fresh pineapple exports by air were continued successfully, but a consignment sent by sea was unsaleable owing to the ship being diverted. A new development was the export to London, by air, of mangoes from Malindi. The fruit was very favourably received, and growers got a better return than they obtained from fruit marketed locally.

Pineapples.—Further fertilizer trials on vlel and black cotton soils have confirmed that good yields of pineapples can be obtained provided these soils are properly drained.

On black cotton soil, sulphate of ammonia at 1 ton per acre and farmyard manure at 20 tons per acre gave a slight, but uneconomic, increase in yield. The nil treatment yielded at the rate of 20 tons per acre. In herbicide trials, Dowpon has given satisfactory control in areas heavily infested with couch, when used at 7–15 lb. per acre. The optimum amount has still to be worked out. Retreatment becomes necessary after 9–12 months.

Tree Crops.—Comparison of yields from irrigated and unirrigated citrus trees, planted 1950–1952, at Jacaranda and Kitale sub-stations, is beginning to give interesting results. At Jacaranda there has been a much more favourable response to irrigation than in previous seasons. At Kitale, some orange varieties have yielded three times the crop when grown under irrigation, and the crop is harvested over a comparatively short period. Unirrigated trees tend to bear in a more irregular manner.

Fuerte avocados from Kitale, sent by air, received favourable comment in Covent Garden. However, the price realized was insufficient to pay for the cost of freight and handling.

Berry Fruits.—The system of strawberry cultivation evolved at Molo, has now been given a thorough trial; it enables the production of heavy crops, at high altitudes, on or near the Equator, at any time of the year, except during periods of heavy rain. At lower altitudes, where strawberries are not always in the

flowering phase, some modification of the system will be necessary. Mass selection of seedling strawberries, with the object of producing strains suited to local climatic conditions, is now in progress.

Asparagus.—The first year's results of the season of cutting trial at Molo, show the heaviest yield during the period December to March, when soil temperatures are highest. A similar trial at Kakamega yielded best in September/October. These trials will have to be continued over a period of years before reliable results can be obtained.

Tomatoes.—A number of trials in connexion with the production of canning tomatoes have been carried out at the Mwea/Tebera and Perkerra Irrigation Schemes. The most important result was from the spacing and staking trial at Perkerra, with the variety San Marzano. The mean yield from the staked treatment was 17,581 lb. per acre, which was lower than the yield from any of the unstaked treatments. The highest yield was from the unstaked double row spacing, $5\frac{1}{2}$ feet $\times$ $3\frac{1}{2}$ feet $\times$ 2 feet, which was at the rate of 26,548 lb. per acre. The main result proves that our policy of not staking is correct.

Cucumbers and Melons.—Trials carried out at Perkerra and Rongai have proved that certain varieties can be produced successfully, whilst others are quite unsuitable for local conditions. Efficient control of Melon Fly was obtained with a Malathion bait.

Plant Pathology

Plant Diseases.—Three hundred and ninety-two specimens of plant disease materials were received. In connexion with plant disease problems, 89 visits were paid to the laboratory. Most of the materials represented fungi recorded in previous years as causing diseases in varying degrees of intensity and distribution. The following, however, have not previously been noted. *Colletotrichum lagenarium* on melon; *Mycosphaerella brassicicola* on cauliflower; *Cercospora carotae* on carrot; *Pseudomonas delphini* on delphinium and *Phleospora herbarum* causing a leaf spot of Russian Comfrey. The chrysanthemum leaf eelworm, *Aphelenchoides ritzema-bosi*, was seen for the first time on chrysanthemums, pyrethrum and the Shasta daisy.

There were 81 additions to the herbarium, of which 15 were sent to the Commonwealth Mycological Institute.

The "Woodiness" disease of passion fruit, the study of which has been in abeyance since the early forties, has again received attention. Surveys of the Sotik and Trans Nzoia have shown that the position is virtually unchanged. Passion fruit seedlings have been inoculated with the Trans Nzoia virus by leaf rub, as a basis of material for further study.

Blight-Resistant Potatoes.—The testing and distribution of blight-resistant potatoes has continued as in previous years. Three are now well established in commercial production. Further introductions were made during the year, including six hybrids from Dr. Black, three varieties and two unnamed seedlings from Northern Ireland. Further small lots of seed of five established varieties, with the object of improving stocks, were obtained from Scotland. Nine Dutch varieties were received from Wageningen, Holland, for trial.

Seed Testing.—The number of samples tested in 1957 was 2,130. This is an increase of nearly 600 over 1956. Owing to this increase in routine testing there was little time for experiments.

Germination tests were carried out for local seed firms. Special tests were made on material from grassland experiments, seed of maize and barley after dressing with mercurial dressings, and on coffee dried in various ways. Samples of maize submitted for the Royal Show were also tested.

Entomology

Work on the compilation of the East African Pest List continued and this should be ready for publication early in 1958.

An experiment on ant and mealybug control in pineapples was laid down using planting material treated by dipping in Diazinon or fumigated with methyl bromide. A reduction in infestation of the rice stem borer, *Rhinaphe vectiferella*, followed spraying with Endrin, but further work is required before adequate control measures can be recommended.

A technique for rearing the Coco-nut Coreid bug in the laboratory has been worked out and bio-assay work on this species is being undertaken. Small-scale field spraying trials have shown that Dieldrin at high concentrations exerts a fair control of this species.

A trial at Gede has shown that complete control of cotton pests more than doubled yield and trebled the value of cotton harvested.

Work in Nyanza was largely confined to cotton pests. For the third year in succession, a BHC/DDT dust has given good yield increases in the Lake shore area. The dust will be in use in African areas on a limited scale next season. In Elgon Nyanza experiments gave considerable promise of economic control of *Lygus* with DDT sprays.

Other work on pests of sweet potato, castor oil, citrus and other crops was carried out.

Investigation began of possible insect vectors of the virus disease, Passion Fruit Woodiness.

Experiments against Barley Fly with Aldrin, Dieldrin and Endrin dry seed dressings gave good control. Sprays of Dieldrin and Endrin gave reasonable but not such good control. Kikuyu grass was recorded as an alternative host.

Heavy attacks of pyrethrum thrips were recorded. In most cases DDT spray gave good control in two applications at a fortnight's interval. Lack of good results in farm sprayings were found to be due to giving a single application only, or to leaving some areas unsprayed. Trials with a Dieldrin spray also proved satisfactory.

Several heavy attacks of the adult *Nematocerus* weevil were recorded, and in all cases DDT or Dieldrin sprays or BHC bait gave control. One or two isolated cases of damage by its larvae were recorded early in the year, and in November, some 400 acres of barley and wheat were severely attacked at Naro Moru. Work is in progress on control measures.

Attacks of *Argyrostagme niobe* Weym on wattle at Turbo and Eldoret were not as severe as in 1956. Life-cycle studies continued on this species and on *Dasychira georgiana* Fawcett.

Experiments with methyl bromide fumigation using the gas sampling technique were carried out on large maize stacks under gas-proof sheets and results will enable improvements in the method to be introduced.

Cob maize dusted with 0.06 per cent gamma BHC in diatomite at about 8 ounces to 9 cubic feet remained virtually without insect damage for over a year inside crib walls lined with hessian sprayed with a persistent formulation of Lindane.

Bagged maize was protected for 33 months after a mixture with 0.3 per cent pyrethrins and $3\frac{1}{2}$ per cent piperonyl butoxide.

The control of pests of stacked maize by dusting treatments with Lindane or spraying with DDT was studied experimentally.

Two infestations of *Trogoderma* from abroad were intercepted and dealt with by methyl bromide fumigation.

Soil and Agricultural Chemistry

Work on the soils of the irrigation projects is reported later.

A notable event in 1957 was the arrival of Dr. A. Mehlich in July, for two years, under an I.C.A. project. He has since been testing out the applicability to Kenya soils, and modifying for local conditions, the rapid routine analytical and secondary mineral characterization procedures which he has developed for the assessment of soil fertility on the yellow and red soils of South-Eastern United States. The results of his tests have justified his starting building a laboratory organization which should ultimately take over much of our routine mineral nutrient soil analysis work.

Lime Studies.—These studies continue. At Kaptagat the yields from the 1956 planting showed a reversal of previous trends, the heavy lime treatment resulting in a depression of growth and yield. The Marindas trial failed, but elsewhere the usual responses were obtained. All 1956 plantings were to wheat.

In the 1957 plantings, early growth at Kaptagat was in keeping with the normal responses rather than the unusual results of the 1956 planting. The 1957 Marindas planting was to a perennial rye grass/Louisiana white clover mixture, a good grass establishment being obtained. The other trials remained under wheat or barley. Those at Eldoret and Kaptagat were not generally satisfactory, low yields only being recorded.

In the associated laboratory studies a slight drop in pH of the lime plots' surface soils was observed at three sites and an appreciable rise in the subsoil pH at two sites.

Exchangeable cations on surface and subsoil samples taken early in 1957 showed anticipated trends. Mehlich exchangeable aluminium was found to be low generally and particularly low at Kinangop and was not consistently influenced by liming. Regarding the 1956 liming effects at Kaptagat, and following on a suggestion by Bremner that bivalent metals are held in the soil as organo-metallic complexes, the possibility was tested that Moodie's activity index is a measure of the capacity of the soil to retain copper, cobalt, zinc, manganese, iron, magnesium and calcium. Copper being the most active co-ordinating element of these, its uptake was studied in particular, and the fraction held by the soil in a non-exchangeable form was found to correlate with the measured Moodie index. Theoretical mechanisms were developed to account for the observed effect of liming on the capacity of soil organic matter to retain copper. In these studies added copper was found preferentially to be taken up by soil organic matter than by the mineral fraction. Pot tests, aimed at determining whether the Kaptagat effect could be due to trace element exhaustion induced in the 1956 crop, revealed no difference in status between the limed and unlimed soils.

Fertilizer Trials.—Work on the trials in African areas continued and has been reported above. In addition a wide scatter of trials has been established on all major agronomic crops, the aim being to accumulate information on fertilizer application techniques.

Bio-assays.—Investigation of the nutrient status of soils using the Webb-Hewitt technique and *Aspergillus niger* cultures was continued, further modifications of procedure being adopted. In the pot tests, phosphate deficiency was again the most widespread and severe. A number of instances of reduced growth where copper, zinc, molybdenum, calcium, magnesium, nitrogen, boron and chlorine were withheld, and of characteristic leaf mottling where sulphur was withheld, were also recorded. Some concordance was obtained between the pot tests and *Aspergillus* results on molybdenum and on zinc.

Plant Products.—The collection and construction of apparatus required for the study of protein constitution in wheat, in relation to dough strength, was virtually completed. The scope of the investigations has been extended to include separation of wheat protein by electrophoresis.

General Analytical Services.—The usual trade and advisory analyses were undertaken and the considerable backlog of advisory samples arising through past preoccupation with irrigation was worked off. Good progress is now being made on the outstanding Departmental Station survey soil samples.

Plant Breeding and Selection

Wheat Stem Rust.—The season suited wheat. In contrast to 1955 and 1956, the incidence of stem rust was less severe and damaged only the more susceptible varieties. The main rust race was again K.16 though three probable new races have been revealed; thus 19 stem rust races have now been identified in Kenya since work began some 30 years ago, and it is significant that no less than 11 of these have appeared in the last seven years.

Much effort in the wheat programme continued to be devoted to the sifting of imported material. With the re-establishment of the rust work under a pathologist, at the Scott Agricultural Laboratories, it has been possible to test the most important varieties with the major stem rust races now current as the basis for planning the new programme of crossing work. It has still not been possible to carry out any investigations into ear rust of wheat or rust of oats, although the need for such work is well recognized. Although the incidence of stem rust elsewhere was generally lighter than for several seasons past, very heavy infections developed at Njoro, one of the new races being largely responsible. As a result a high proportion of promising new strains, representing the first products of the expansion of work which began in 1950/51, was destroyed. Destruction also took place in the large multiplication plots; only two of the eight imported varieties taken from the nurseries for direct issue survived the attack sufficiently well to be safe for further use. The present policy of intensifying the district testing and of replicating the breeding material should enable rust resistance to be evaluated on the widest scale whilst minimizing such losses.

New Cereal Varieties.—Eight wheats bred locally and two introduced varieties, Mida-Cadet from Canada, and Capella from Italy, were released for the 1957 season. Hopeful and Impala, two South African varieties, privately introduced, also proved a success. Barley No. 5 from Eire, Heimdal from Sweden, and the Canadian oat, 3003 F, were also released.

Maize Breeding.—The rapid expansion of maize breeding at Kitale continued, and additional work was begun at sub-centres in the Trans Nzoia to give a wider basis to the programme. The first Kitale synthetic underwent further selection and trial. Work went ahead on the development of a second synthetic to be ready for release in 1960 or 1961. Work on synthetics is being planned in such a way that a hybrid programme can follow on as a natural development. A reduced programme of work on the same general lines continued at Njoro. The Njoro synthetic released in 1957 appears to be acclimatizing itself to individual farms and the dry season has suited it. Its success is encouraging.

Irrigation

Chemistry.—The Chemistry Section continued the determination of salinity and alkalinity on the large number of soils which originated from the Mwea, Perkerra, Lodwar, Garsen and Hola irrigation projects in connexion with the land use surveys which were undertaken on them. The results obtained have been encouraging on the first three projects but not on the last two. Except at Hola, where crops have exceeded the expectations of the analyses, the laboratory results have been in line with such field observations as exist.

Hola.—The salinity trials at Hola on the desert hinterland of the Lower Tana were continued and elaborated. The soluble salts in the red soils there proved quite mobile, less than a month of leaching being required to lower salinity to a safe level throughout the top three feet. For a salt situation to be improved to a much greater depth dressings of the order of 20 tons of gypsum per acre, associated with more prolonged leaching, proved necessary; less than this had little effect. The effects of leaching and gypsum on alkalinity have been distinctly less marked. The response of the test crops to these land reclamation treatments has also been disappointing and in some instances the effect has been a marked depreciation of growth. The likelihood that this is due to a washing out of nitrates as well as soluble salts from the surface soil during leaching is now under test. On the heavier yellow soils at Hola leaching proved much slower and the intervention of a period of drying out or of green manure cropping has been found necessary for satisfactory water penetration to be secured.

In other trials at Hola production was found to be maintained over 18 months of continuous intensive cropping and the land has been found to become more easily tilled. Greater success has been attained with cotton and rice than other crops, and when these were planted in the right season they yielded well. Many other crops grew well, but yielded disappointingly, often for no apparent reason; the cause of this awaits investigation. Pests were varied and troublesome and constant application of insecticides has been necessary for protecting crops.

Irrigation Research Station, Mwea.—Work on rice comprised experiments on varieties, fertilizers, spacing and methods of planting, pest control, and water measurement. The variety work consisted of the maintenance of the collection which this year contained 66 varieties, and a trial of 10 promising varieties. The variety recommended for the Mwea/Tebere Irrigation Scheme is still Sindano. Rice showed a large response to 75 lb. per acre of double superphosphate applied at transplanting, and to sulphate of ammonia in the presence of phosphate. Close spacings at 6 × 6 inches and 9 × 9 inches yielded better than 12 × 12 inches in transplanted rice, but there was no difference between planting one, two or three seedlings per clump.

A preliminary spraying trial against the rice stem borer, *Rhinaphe vectiferella*, which sometimes does severe damage in this area gave inconclusive results. An investigation was started to measure the water required by a rice crop on the black soil, the measurement being done by a water meter installed in the pipe irrigation system.

Crops other than rice were investigated for the black soils. Growth of cotton and *Hibiscus cannabinus* was inferior on these black soils to that on the red soil. Various food crops including sorghum, bullrush millet, beans and grams grew fairly well on low camber beds made by ploughing after rice, but not on the flat. The fodder crops, velvet bean and sweet potato, grow extremely well on such beds and are suitable for rotation with rice.

Experiments on irrigated crops on the red soil were mainly observational. Apart from the common field crops, the emphasis was on testing horticultural crops suited to canning—tomatoes, asparagus, green beans and sweet corn. Vegetables for the Indian market—red onions, garlic and chillies—were also tried. The jute substitute, *Hibiscus cannabinus*, was also grown.

Agricultural Machinery Testing

The East African Tractor and Implement Testing Unit started to function at the beginning of the year. The headquarters of this unit was moved from Eldoret to Nakuru in March. The unit works in two main sections, one on tractors and the other on implements.

TRACTOR SECTION

(1) *Farm Trials*.—The original intention was to test 42 tractors of six different makes over a period of 2,000 hours. Initial tests on eight tractors brought to light certain faults on five of them, so the test was confined to the three satisfactory tractors which were all of one make. The manufacturers of the other makes immediately either set about rectifying the troubles or applied to the unit for tests and investigational work, with the result that, at the end of the year, a total of four makes was ready for the farm trials tests.

(2) *Altitude Tests*.—Most makes of tractors were tested at various altitudes during the year. A full test on the Ferguson FE.35 (diesel) was carried out and the report has been published. Reports on the David Brown "900" and the Ransome MG.6 (with diesel and petrol engine) are near completion. It is hoped to complete work on other makes in 1958.

(3) *Special Tests and Investigations*:—

- (a) Investigations into the effect of altitude on pneumatic governors have been carried out.
- (b) Diesel fuel pump calibrations for various altitudes have been carried out for three manufacturers.
- (c) Fuel filter and air intake filter tests are still being investigated and three manufacturers have already made modifications, due to the results to date.
- (d) Dust investigational work continues on two lines; one, the measurement of dust cloud densities and particle size in which equipment works in certain parts of East Africa. The second line is the proving of where and how dust enters working parts which are supposed to be protected.
- (e) A comparison test of four models of tractors has been carried out for the Uganda Government.

Implement Section.—Work has mainly been confined to the testing of various models of rotary cutters, slashers and light bush-clearing equipment. Most of these machines have been tested on—

- (a) grass cutting;
- (b) pasture topping;
- (c) weed control;
- (d) regeneration control;
- (e) light bush-clearing; and
- (f) shredding of crop residues.

The only full report to be published is on the F.M.D. rotary slasher, but interim reports on other machines have been submitted to the N.I.A.E.

Other work has included short trials on plough settings under various conditions and advisory work to numerous Government departments.

Both sections have carried out a certain amount of soil shear work, the results being sent to the N.I.A.E.

PART III—FIELD SERVICES

Progress in Improved Farming

EUROPEAN AREAS

The trend towards alternate husbandry systems continues in the Highlands. This is underlined by an increase in the grass ley acreage and in stock numbers particularly pigs and sheep. The demand for farm planning continues unabated. The diversification of the average farm enterprise in the Highlands is taking place at the right time and will give a sounder base from which to tackle the economic blizzards ahead.

Financial reinforcement of these developments continued to be provided by development loans administered by the Board of Agriculture. During the year, 189 farmers took up loans totalling £347,141. The money was allocated for the following purposes:—

	£
Purchase of cattle	155,454
Purchase of sheep	49,330
Purchase of pigs and poultry	9,842
Fencing	21,380
Water supplies	43,607
Dips and sprays	6,005
Buildings	11,267
Machinery	36,041
Various	14,215
TOTAL ..	£347,141

ASIAN AREAS

A growing number of Asian sugar cane growers in the Kibos area of Central Nyanza are adopting more progressive methods. The price paid by the Miwani Mills for cane has continued to be a source of dissatisfaction.

At the Coast, new developments included the marketing of good quality bananas from an estate in Malindi by lorry direct to Nairobi.

AFRICAN AREAS

Nyanza Province.—The most striking advance has been achieved in Elgon Nyanza District during the year. Here, growing appreciation of the value of land for farming has resulted in the voluntary consolidation and demarcation of holdings under the tribal authority. The enclosure of holdings, the construction of cattle sheds and the use of manure have also been features of continued progress in Kericho District, the Kisii highlands and in North Nyanza. In Kisii, particularly, there has been much progress in simple farm planning and getting the arable lands worked on the contour with a rotation of crops.

Only two districts, Elgon and Central Nyanza continued to give rewards for good husbandry, and in both districts it has been decided to discontinue awards in 1958. Good husbandry certificates, whereby farmers can sell their maize in three-ton lots at a higher price are being continued.

The following loans were made to farmers in 1957:—

			<i>ALDEV</i>		<i>A.D.C.</i>		<i>Total to end</i>
			<i>No.</i>	<i>Value</i>	<i>No.</i>	<i>Value</i>	<i>of 1957</i>
				£		£	£
Kericho	..	..	—	—	12	2,200	8,720
South Nyanza	..	..	—	—	8	500	2,127
North Nyanza	..	..	97	2,050	—	—	12,694
Central Nyanza	..	..	—	—	—	—	395
Elgon Nyanza	..	..	—	—	—	—	8,300
			97	2,050	20	2,700	32,236

In South Nyanza a new system has been adopted whereby the loan is paid into individual bank accounts. Cheques drawn by the farmer are honoured only when countersigned by the local Agricultural Officer. Expenditure is thus controlled without our staff having to make all purchases and issue the loan in kind which was not popular with the farmer.

There are now 24 tractors operated by Africans in Kericho District. These are generally jointly owned by a group of farmers but are rarely operated successfully. Central Nyanza farmers purchased seven tractors during the year mainly for contract ploughing, the charge for which varied from Sh. 50 to Sh. 70 an acre. In South Nyanza, one African-owned tractor operated doing ploughing at Sh. 100 per acre. There is obviously a need for courses on mechanized farming and these will be instituted at Bukura Farmers Training Centre in the coming year.

Only in Elgon Nyanza did African producers buy fertilizers in any quantity. The Lugulu Co-operative Society sold 10 tons of phosphatic fertilizers to members.

Rift Valley Province.—The areas of high potential showed steady progress. In Elgeyo further survey has been carried out and an area of 12,000 acres has been planned on a skeletal Soil Conservation layout and the cut-off trenches constructed. Conservation work in the Sarora and Kaimosi areas of Nandi District has been completed. Water has been laid on to individual holdings in the Ndalat area of Nandi and in Kaimosi. Farm planning is making good progress in West Suk. A piped water supply has been brought to the edge of the Baringo Reserve. It is estimated that only 25 per cent of the high potential area is under crop, the balance being grazed by unimproved and relatively unproductive stock. Livestock improvement must therefore take first place in developing the African areas of this Province.

Central Province.—Land consolidation and demarcation made good progress during the year. Kiambu was well ahead of the other districts and it is hoped to finish all demarcation in this district by the middle of 1958.

In the Province as a whole, 674,651 acres have been covered in the process of fragment measuring and a total of 290,524 acres has been demarcated. These figures include settlement schemes. There are now 909 planned farms in the Province covering 10,473 acres. In addition, simple farm layouts have been made for 2,527 holdings covering 24,311 acres. These dispense with the detailed maps provided in a proper farm plan and enable the ground to be covered more rapidly.

Southern Province.—The greater use of manure, more cattle sheds, some of permanent materials, the introduction of fertilizers, the wider use of good crop husbandry methods and the beginning of better animal husbandry and grazing management were the main features of progress superimposed on the framework of soil conservation works already established. Farm planning was started in all three districts towards the end of the year. In the Northern locations of Machakos District there are indications of a desire for land consolidation and several farmers, by sale or exchange, consolidated their holdings on their own initiative.

Coast Province.—The coco-nut improvement continued and a total of 11 square miles was worked in Kwale and Kilifi Districts. 57,000 seedlings were sold and over 6,000 acres of undergrowth cleared. 13,000 unproductive palms were felled. The campaign to improve the standard of cotton cultivation continued. Land consolidation was started in the Taita Hills during the year but met with opposition, and by the end of the year only five holdings covering 40 acres had been dealt with. The work continues on a voluntary basis. Land enclosure in the Taita Hills is proceeding by individual effort.

Reconditioning, Resettlement and Development Schemes

NYANZA PROVINCE

Lambwe Valley.—At the end of the year there were only 415 settlers, including squatters at the south end of the valley compared with over 600 in the previous year. Owing to lack of interest by South Nyanza farmers, the valley was opened to Luo of Central Nyanza but very few are coming forward. The holdings are beginning to make progress now that enclosure on many is completed. One settler made a gross profit of Sh. 1,973 from the sale of crops and stock.

Kimulot Scheme.—There are 245 farms on this scheme mostly of 20 acres. 106 of these have tea planted, 64 are enclosed by stock-proof hedges and 11 have roofs with water catchment. The main effort during the year was concentrated on bush clearing and the establishment of pasture.

Itembe Scheme.—Of the 314 farms surveyed, 281 are now occupied. Of these, 165 have perimeter fences.

Kibos-Awach Scheme.—162 miles of terracing was completed in 1957 together with seven miles of grass strips and $1\frac{1}{2}$ miles of stone-walling.

CENTRAL PROVINCE

Kibirichia-Ruiri Scheme.—Several thousand acres were opened for cultivation during the year and there are now 793 farms varying from eight to 20 acres in size. The range of work included the completion of four water storage tanks, the planting of 12 acres of pyrethrum and an A.I. scheme to produce grade Guernsey stock for the holdings.

Mutuntu Settlement Scheme.—This scheme has met with apathy amongst the people who have failed to demarcate their holdings.

Thuura-Nkabune Scheme.—The total acreage now settled is approximately 7,500 acres. On the 315 20-acre farms over 100 settlers have started building their houses.

Embu Settlement Scheme.—The area is now occupied and consists of 153 farms of which 75 have been fully planned and the rest are working on a simple layout. Good grain crops were harvested and encouraging results were obtained from pineapple plots.

Kanja Pilot Dairy Scheme.—All farms in this scheme have maintained a high standard of development. Pyrethrum gave poor yields here and the Corriedale sheep did not maintain condition. The area is in the High Bracken Zone of Embu District.

Ishiara.—There are 36 farmers settled on irrigated holdings and it is estimated that a further 13 holdings can be added. Work on the extensions has begun. Good crops were harvested but there are indications of an increase in soil salinity on four holdings.

SOUTHERN PROVINCE

Machakos District Reconditioning Scheme.—The extension side of this scheme, covering the reserve, continued during the year and progress was reflected in the increased income derived from better farming and the establishment of cash crops. The Mechanical Unit ceased operations and was moved to the Yatta furrow project.

Makueni Settlement Scheme.—A further 9,500 acres have been cleared and stumped, making a total of 21,000 acres in three years. There are now 2,032 settlers on the scheme, an addition during the year of 428. Further settlement ceased in August, the aim being to concentrate on development in the settled holdings.

COAST PROVINCE

Gedi Settlement Scheme.—There has been little change in the numbers settled. The planting of tree crops continued.

Shimba Hills.—The total number of settlers is now 114. Kamba settlers from Machakos have not been coming forward in the numbers anticipated. Crops were reasonably good but the main cash crop of chillies failed.

RIFT VALLEY PROVINCE

Riwa Grazing Scheme.—This scheme is in its third year and is now very popular having achieved a good grass cover. The Kipkoma area, run on similar lines, is also proving successful. The third area in West Suk under grazing control at Batei is hilly and badly eroded and short of water. Waterhole sites have been selected.

Esageri Ranching Area.—This ranch in South Baringo is now carrying just under 3,000 head of cattle on an area of some 26,000 acres. Bush control has yet to be tackled, but firebreaks have been bulldozed and ploughed to facilitate burning as a means of control. A similar scheme is now under way at Gobat.

Perkerra Catchment Area.—The Perkerra Grazing Scheme amounts to 23,000 acres and contains some of the worst eroded land in the Perkerra catchment. Two-thirds of this land has been closed down during the year. Properly controlled grazing will commence in 1958.

Sarora Settlement.—All the arable land is now occupied and there remain a further 40 ranch holdings for distribution.

Kaimosi Settlement.—73 holdings have now been settled. It is estimated that a further 30 arable holdings will be allocated and the remaining land used for ranch holdings.

Soil and Water Conservation

The Soil Conservation Engineer's headquarters and the "Agron" Workshops functioned in 1957 on the same lines as indicated in greater detail in the 1956 Report.

SOIL CONSERVATION—EUROPEAN AREAS

Terracing.—Comparative figures of work done are set out below and further details are given in Table E.

ACREAGES PROTECTED BY SOIL CONSERVATION MEASURES

DISTRICT	1941-54	1955	1956	1957	Total
Trans Nzoia	45,366	4,047	9,412	4,426	63,251
Uasin Gishu	39,443	9,212	8,355	12,734	69,744
Nakuru	52,144	5,292	5,800	7,095	70,331
Thomson's Falls ..	31,600	4,175	8,213	10,764	54,752
S. Kinangop	—	3,212	4,922	6,562	18,468
Nyanza	8,395	179	579	1,079	10,232
Nairobi	4,013	977	439	501	5,930
TOTAL	184,733	27,094	37,720	43,161	292,708

Permanent Crops.—Work on tea, coffee and sisal estates in the Nairobi and Nyanza areas continued. The acreage known to be protected by suitable soil conservation measures is shown below:—

SOIL CONSERVATION IN PERMANENT CROPS (ACRES)

CROP	1941-54	1955	1956	1957	Total
Sisal	6,011	2,200	1,675	850	10,736
Wattle	4,556	—	—	—	4,556
Tea	4,320	—	355	362	5,037
Coffee	1,188	151	188	159	1,686
New Zealand Flax ..	999	—	—	—	999
TOTAL ACRES ..	17,074	2,351	2,218	1,371	23,014

Farm Planning.—The heavy demand for this service continues and there is a large programme for 1958. Particulars of the work done are given below:—

FARM PLANNING, 1957

DISTRICT	Farms Surveyed and Mapped		Farms Planned		Total Planned 1951-57
	<i>No.</i>	<i>Acres</i>	<i>No.</i>	<i>Acres</i>	<i>Acres</i>
Nakuru	14	14,541	16	16,907	59,252
Uasin Gishu	13	18,101	7	8,560	42,224
Trans Nzoia	5	6,317	5	5,453	19,141
Thomson's Falls	10	12,923	3	3,200	29,722
Nyanza	5	5,627	—	—	6,345
Nairobi	1	102	—	—	11,373
TOTAL ..	48	57,611	31	34,120	168,057

In addition to the above, policies for seven farms, totalling 12,554 acres on the South Kinangop, have been prepared. Planning Officers have been kept extremely busy in following up plans prepared in previous years as well as attending to new work.

TABLE E—SOIL CONSERVATION SERVICE (EUROPEAN AREAS)

Output of Terracing, etc., for Year 1957

DISTRICT	No. of Farms Treated by Tractor	Broad Base and V Terraces	ACREAGE PROTECTED BY			Total
			Diversion Ditches	Narrow Base Terraces	Bench Terraces	
Trans Nzoia ..	71	1,593	2,833	—	—	4,426
Uasin Gishu ..	47	4,290	8,444*	—	—	12,734
Nakuru	28	2,038	5,047	—	—	7,095
Thomson's Falls ..	31	11	10,753	—	—	10,764
S. Kinangop ..	28	242	5,970	150	200	6,562
Lumbwa	24	562	150	367	—	1,079
Nairobi	10	420	—	60	21	501
TOTAL ..	239	9,156	33,197	577	221	43,161

*Includes 8,240 acres in Nandi and Elgeyo Districts.

COMPLEMENTARY WORKS

DISTRICT	Roads	Excavation	Training Banks	Outlet Drains	Cut-off Drains	Small Dams	Camber Beds
	<i>yd.</i>	<i>cu. yd.</i>	<i>yd.</i>	<i>yd.</i>	<i>yd.</i>	<i>cu. yd.</i>	<i>acre</i>
Trans Nzoia ..	83,746	5,390	7,294	53,337	69,585	22,000	—
Uasin Gishu ..	65,255*	9,030	1,633	22,747	4,864	82,520†	—
Nakuru ..	72,032	—	7,415	9,335	58,256	106,641†	—
Thomson's Falls ..	55,649	28,791	8,381	40,214	114,380	77,463†	—
S. Kinangop ..	99,000	17,750	8,870	18,870	1,900	6,000	—
Lumbwa ..	14,907	40,400	—	4,534	2,062	6,626	—
Nairobi.. ..	22,723	29,415	886	9,478	1,798	—	117
	413,312	130,776	34,479	158,515	252,845	301,250	117

*Includes 10½ miles of roads in Nandi and Elgeyo Districts.

†Includes work in Elgeyo, Kamasia and Samburu.

Land Preservation Orders.—The Director of Agriculture issued 31 Orders under the Agriculture Ordinance in 1957, of which 21 were cancellations of previous Orders and the rest required either the closure of eroded land or terrace protection works. In the Nairobi District, River Scouts laid out 416 miles of narrow-base terraces in African cultivations on European estates. River Scouts continued to supervise squatter cultivation in Kericho District.

SOIL CONSERVATION—AFRICAN AREAS

Nyanza Province.—The turn-out of communal labour for soil conservation work in general has fallen considerably during the year. In the Kisii Highlands the trash lining continued and an ambitious scheme has been started to plant up the high ground with trees. The grass strip continued to be the main method of control in Elgon Nyanza and also in Kericho District where, with the widespread use of hedges, control was satisfactory. In Central Nyanza the people still fail to appreciate the need for soil conservation measures, and a proportion of the work done was on the maintenance of old terrace systems. In North Nyanza, work started in the badly eroded Wanga and South West Divisions.

Rift Valley Province.—There are now 200,000 acres of controlled grazing schemes in this Province and it is by such means that the semi-arid areas are being reconditioned. In Elgeyo and Nandi the Soil Conservation Units constructed cut-off drains over an area of approximately 30,000 acres for the local African district councils. In Baringo there are now 60,000 acres under narrow-base terracing. 12,000 tree seedlings were issued in Elgeyo and the Tugen Hills.

Central Province.—The situation in the Province is reasonably satisfactory with the exception of Fort Hall District which requires and will get attention. Cattle sheds have been built at all villages, and as the people leave villages to go to their own farms they are required to build cattle sheds.

Southern Province.—Communal terracing continued in all districts. Nearly 14,000 acres were protected by narrow-base terraces. In Kitui District 49,825 acres were cleared of bush and 24,482 acres planted to grass. In Machakos 1,500 miles of bench terraces were constructed.

Coast Province.—Work on trash lines continued. The accumulation of fertility on the site of the trash line militates against permanency and it tends to be cropped after a year or so. In the Taita Hills a special drive was made in the short rains to establish live wash stops. A total of 14,357 acres was treated in 1957 by trash lining, live wash stops and contours.

WATER CONSERVATION—MECHANICAL DAM CONSTRUCTION UNITS

The work done by the mechanical units is detailed in the table below:—

DAM CONSTRUCTION, 1957

UNIT	No. of Dams	Earth Moved	Water Storage	Cost per Cubic Yd.	Tractor Hours Worked	Mean Output per Tractor Hour
		<i>cu. yd.</i>	<i>mil. gal.</i>	<i>Sh.</i>		<i>cu. yd.</i>
HEAVY UNITS—						
No. 1 D.C.U. . .	3	249,466	154·3	3·19	6,707	35·57
No. 2 D.C.U. . .	3	145,741	21·3	1·87	2,546	58·69
	Repairs	21,876	—	1·23	685	32·0
S.C.S. UNITS—						
Eldoret	10	82,520	92·3	—	1,886	43·2
Thomson's Falls	8	77,463	91·0	—	2,015	38·4
Kitale	5	22,000	21·0	—	872	25·2
Nakuru	21	106,641	48·75	—	2,522	42·2
Ruiru	—	—	—	—	—	—
Lumbwa	3	6,626	3·44	2·05	195	34·0
S. Kinangop . .	2	6,000	3·00	—	247	24·2
TOTAL	55	718,353	435·09	—	17,675	37·05

No. 1 Dam Construction Unit worked in the Thika and Ruiru areas throughout the year. No. 2 Dam Construction Unit moved out of Nyanza Province in September to the Hola Irrigation Scheme where work on canal construction is now in progress.

WATER SUPPLIES—AFRICAN AREAS

The work done in the Provinces is outlined below:—

Southern Province.—Sub-surface dams completed, 46; earth dams, 32; concrete dams, 2.

Coast Province.—No dams built. The Kilifi District A.D.C. tractor unit concentrated on the repair and improvement of existing dams.

Nyanza Province.—Earth dams built, 7.

The maintenance of dams received attention, particularly in Elgon Nyanza where some dams constructed six years ago have no effective hedge or fence.

Central Province.—Some villages have clubbed together and, with the help of emergency funds, have provided themselves with piped water supplies. This applies in Nyeri, Kiambu and Fort Hall Districts.

Rift Valley Province.—Earth dams built, 3; waterholes, 10; hafirs, 14.

Piped water supplies to 84 farms in the Chepkorio area of Elgeyo were completed and to 14 farms in the Ndalat area of Nandi. The policy in the high potential areas of the Province is to make water available in a pipeline in a given area and encourage offtake into individual holdings.

FIELD DRAINAGE

The Hyster machine was used for digging deep ditches at Ol Joro Orok and Wanjohi. Progress was slow owing to the operators being inexperienced. On the Kipkabus Plateau three drainage schemes with ridge and furrow were carried out. Further work was done at Endebess. The demand for the construction of camber beds in the Ruiru area continued during the year and 871 acres of vlei land was surveyed for this purpose, 120 acres being constructed by the Nairobi District Unit.

Investigations on land drainage continued under the supervision of the Senior Soil Conservation Engineer on various sites from Sotik to Thika.

Irrigation

The General Manager, Irrigation Development Projects, reports as follows:—

Once again it is disappointing to have to report a much smaller area developed than was hoped for during the period under review. Land levelling by hand is always a slow and laborious task, particularly so with an unwilling labour force, and for speed the answer must be machinery. At Tebere it had been hoped to be able to utilize the services of the Dam Construction Unit but this Unit had to be diverted to Hola for a high priority job and will not be available until the middle of 1958. At Perkerra the Cat. 12 Grader is doing good work but its daily output has been disappointingly low, due to the fact that it has now run into more difficult terrain.

At *Mwea-Tebere* on Block "A", the first phase of development, 1,027 acres, have now been levelled and 564 acres fully prepared for irrigation with field gates and drops, etc. On the Nguka Swamp no further development took place and the prepared area remains at 282 acres.

The rice crop sown in the short rains of 1956, some 456 acres, produced a most disappointing yield, averaging only about nine bags per acre of very mixed rice. Quelea did a large amount of damage to this crop. An attempt was made to grow a crop of maize and beans on the black soils during the long rains this year, but proved a failure due to lack of drainage and the crop was ploughed in and the land prepared for the short rains rice crop. On the red soils, maize and beans were sown but did not result in good crops, especially on the "cut" part of the terraces. It is hoped to overcome this by growing a green manure crop on this area and ploughing it in, thus restoring fertility. A short rains crop of rice was planted on the black soils and has always promised well though, at one time, it seemed likely that it would be exterminated by Quelea. Two timely sprayings from the air with parathion, however, destroyed the birds and completely saved the crop. Early results are showing an average return of 25 bags of good, clean rice per acre and one plot has even reached 37 bags to the acre: a most satisfactory result. The final results of the cotton grown last season were disappointing, the best result being 700 lb. per acre Egyptian variety BAR XL3 on the black soil and 500 lb. per acre American variety S.47 also on the black soil. The cotton was of poor colour, having suffered severely from stainers. This season a further 16 acres of various varieties of cotton are being tried and, in spite of initial setbacks, the cotton is now growing exceedingly well on the red soil. On the black soil, however, it is not so good. The tomato crop sown last season resulted in a low yield of about $4\frac{1}{2}$ tons per acre, sun-scorch was very bad and it is estimated that half the crop was lost, due to this cause. A further 40 acres of tomatoes has been sown again this year, but once again the crop is not very promising. Some 50 acres of *Hibiscus cannabinus* have been sown, the two varieties tried being local Kitale and imported Cuba. The Kitale strain

is not a success, the output of fibre averaging under 400 lb. per acre, which is sub-economic. The Cuba strain promises to be better, but even that is not likely to give as good a yield as was obtained from the Tanganyika strain grown last year. Unfortunately, it was not possible to get seed of this strain for the current season, but it is hoped to get a further supply for next year. Other crops tried with varying success have been onions, lupins and beans.

One hundred and seventy-eight families were given two-acre tenancies during the season. More tenancies could have been given out especially on the Nguka Swamp area, but many settlers decided against taking up a tenancy and wished to be returned to their reserves. With the good results now obtained from the rice it is not expected that there will be any difficulty in filling tenancies in future and it has been decided to increase the size of the tenancies to five acres each. Considerable building work has gone on during the year on village construction and some 903 houses have now been completed. There are 1,077 settlers on the scheme, 508 women and 1,120 children. In addition, there is a paid labour force of 286. The number of detainees available for work on the scheme had fallen to 2,467 by the end of the year.

At *Perkerra* there was considerable delay in land preparation early in the season due to constant failure to materialize of machines promised for the job, and it was not until the end of March that it was possible to hire a Caterpillar 12 Grader from Messrs. Mowlems. This machine carried on until the end of August, assisted for a while by a Soil Conservation machine, but from there on the levelling has been done by the Scheme's own machine. 1,092 acres have now been levelled and 852 acres fully prepared for irrigation. During the year it became apparent that the areas marked on the original maps were hopelessly inaccurate and that, in fact, a far smaller acreage had been developed than was previously reported. A Surveyor has now been taken on to deal with mapping out the fields for levelling and also to check up on all the original areas.

The tomato crop grown at the end of last season proved a failure, yielding under two tons to the acre, due chiefly to eelworm and sunscorch. A further 86 acres of tomatoes were planted in April but the resultant yield was still low, only giving an average of 4.36 tons per acre. In spite of these failures, a further 73 acres was planted in August but, as expected, the crop has been sickly throughout and is riddled with blight and mildew and is not expected to yield one ton per acre.

Seventy-five Tugen and Njemps tenants have been settled on the land and have done well, growing a good crop of maize which averaged about 15 bags to the acre. Once again there has been considerable loss from theft of scheme-grown maize. *Hibiscus cannabinus* yielded $4\frac{1}{2}$ bags of seed per acre, and a satisfactory fibre was also obtained from the plants after taking the seed crop. Groundnuts yielded 13 bags of shelled nuts per acre. Haricot beans were not successful.

During the year an experimental area has been laid out in conjunction with the A.D.A., Rift Valley Province, and the Horticultural Officer, Molo, and various experiments are being carried out regarding crops, rotations, etc.

Detainee labour has now ended with the closing of the Marigat Camp in October. Imported Kikuyu, Embu and Meru labour has proved unsatisfactory and has been returned to their reserves. Local labour is now coming in and working satisfactorily.

At *Hola*, priority has been given to the proposed 500-acre Pilot Scheme on which work is now progressing fast. Unprecedented heavy short rains, over $9\frac{1}{2}$ in. in two months, delayed arrival of part of the D.C.U. and extra

labour and the expected acreage to be ready by the end of March has been reduced from 500 to 250–300 acres. Some 340 acres of bush have now been cut, 120 acres cleared and 60 acres ploughed. The D.C.U. have cleared the whole 10-mile trace for the canal and has started excavating. The pumps and pontoon have been ordered from the United Kingdom and will be installed by contract. Labour for all this work has been very short but the position is now easier, due to the arrival of extra labour.

On the experimental area, leaching on the grey soil plots was negligible but was more promising on the red soil plots and crops grown on the latter treated plots have done well. A further 18 acres were cleared for experimental work and many experiments laid down by the Chief Research Officer and Soil Chemist. Three acres were cultivated as a trial tenancy holding. The acre of maize produced 1,831 lb. shelled, but the acre of cotton sown in the second half of June suffered severely from the heavy rain. A second acre of cotton planted in the first half of October promises well as does an acre of groundnuts sown in the second half of October. Wimbi and cow pea were sown on the remaining acre. Yields per acre of crops grown on plots of red soil have been groundnuts, 996 lb.; velvet beans, 946 lb.; castor, 305 lb.; green gram, 414 lb.; and wimbi, 1,768 lb. The best yield of cotton so far on the seasonal sowing trials is 2,723 lb. per acre for April sowing. Onions have yielded about two tons per acre. Stalk borer on maize and bollworm and stainer on cotton have all been active but have been controlled by spraying.

Nyanza (Kano Plains).—It has still not been possible to complete the necessary arrangements for acquiring sufficient land for the experimental station near Ahero.

Lodwar.—A complete survey of the proposed area was carried out by Hunting Aero-Surveys and, though the report was favourable, it was decided not to proceed with this project at present owing to shortage of funds and its low priority.

Agricultural Education

THE TRAINING OF AGRICULTURAL INSTRUCTORS

Particulars of the instructors in training at the centres at the end of the year are given below:—

Two-year Course

<i>Province</i>	<i>1st Year</i>	<i>2nd Year</i>	<i>Total</i>
Nyanza (Siriba)	27	31	58
Central (Embu)	7	15	22
Coast (Matuga)	31	13	44
Rift Valley (Kapenguria)	25	15	40
	90	74	164

Disciplinary action was necessary at both Siriba and Embu Schools during the year. The whole second-year class at Siriba staged a “strike” as a result of which they were all sent home and ten failed to return. The first-year class at Embu, all School Certificate, had to be suspended and the resulting expulsion of one student was followed by the failure of five others to resume their studies

thus reducing this class from 13 to seven. Of the nine second-year students who took the final examination at Siriba three failed. At Embu it is expected that 12 of the 15 second-year students will qualify for the Leaving Certificate. Final examinations at Matuga will be held in April, 1958. From Kapenguria 15 students passed out at the end of the year. Special courses at these centres included a farmers' course at Kapenguria, and refresher courses for Agricultural Instructors at Matuga and at Embu.

Farm Institutes.—Ten trainees were in residence at the Bukura Farm Institute. Building is now in progress to accommodate short courses of 100 students at a time from North and Elgon Nyanza. At Kabianga development of the holdings has made good progress and I.C.A. funds have been made available to provide accommodation for farmers' courses. The holdings at the Siriba Farm Institute continued to serve a most useful purpose as demonstrations for the farmers attending short courses at the nearby Maseno Jeanes School. The intensive $3\frac{1}{2}$ -acre holding showed a net profit of £70 on the year's working. At the Kisii Farm Institute the holdings achieved an average gross profit of Sh. 1,480. The 2-acre intensive smallholding at Kakamega achieved a gross income of Sh. 4,792 against expenditure on four labourers and a watchman. The labourers do not overwork and it is believed that an energetic family could run this holding.

At Kaimosi all the buildings were completed including a workshop and lecture room financed by the Nandi African District Council. A Training Centre was built and opened at Nkuene in Meru District during the year. Courses were held for Agricultural Instructors and selected farmers. The Wambugu Farm Institute at Nyeri was completed and a number of different-sized smallholdings established. The first courses for Agricultural Instructors and selected farmers were held in September with particular emphasis on cattle management. The Thogoto Training Centre, Kiambu, was taken over from the Church of Scotland Mission at the beginning of the year and development is proceeding with a view to opening courses for farmers and Agricultural staff.

School Gardens.—Work on school gardens continued in all Provinces. In the Central Province efforts were made to plan farms at a number of schools with varying success, but the work has generally been held up while land consolidation proceeds. Schools naturally do not wish to plan their farms until their boundaries are known and they are certain these will not be changed. In Nyanza more intermediate schools have been surveyed and planned and there has been improved co-operation from schoolmasters. In Southern Province school gardens have been employed widely as a means of demonstration of improved cultivation.

Young Farmers' Clubs and Better Farming Societies.—There are now 18 Farmers' Clubs in North Nyanza with a membership of 185. The clubs meet on selected days to assist each other on development work on their respective farms. The five Farmers' Societies in Elgon Nyanza continue to be keen on development. There are a few societies in Central Nyanza but their main activity is self-praise. In the Coast Province the eight Young Farmers' Clubs are all in the Rabai Division while there are two Farmers' Clubs at Kaloleni and in Rabai respectively.

In the European areas Young Farmers' Clubs were active in Eldoret and the Nairobi area. Farmers' Days and demonstrations were arranged at departmental farms and research centres, close co-operation being maintained with the various farming bodies interested and in particular the Coffee Board of Kenya, the Royal Agricultural Society of Kenya, the Kenya National Farmers' Union, the Pig Industry Board and the Sisal Board.

AGRICULTURAL SHOWS

In addition to the main shows organized by the Royal Agricultural Society of Kenya at Nairobi, Nakuru, Eldoret, Kitale and Nanyuki, District shows were held at Kilifi, Fort Hall, Kiambu and Machakos.

Marketing

PRODUCE MARKETING AND INSPECTION

Details of the quantities and value of produce that passed through the markets in 1957 are given in Table C. The position in the African areas during the year was as follows:—

Nyanza Province.—The Nyanza Province Marketing Board during its first year of operation in 1957 handled the marketing of all crops with the exception of coffee, pyrethrum, bananas, potatoes and onions. Close co-operation was maintained with this Board which is providing an efficient marketing service. The Board published a monthly news bulletin giving the latest market situation and instituted monthly radio talks in the vernacular languages in an effort to keep African producers and traders informed.

Central Province.—With new marketing officers in most districts, African Produce Inspectors were recruited and had to be trained on the job. Maize and controlled produce surpluses from Fort Hall, Embu and Meru were marketed on improved lines though rejections due to high moisture content were frequent. A complete closure of controlled produce buying was effected for a short period to ensure that licensed buyers' premises were properly treated with insecticide. The closure of the pineapple cannery at Thika caused a setback in that industry but fruit and vegetable exports to established markets continued favourably and as with all types of produce a strict control on quality standards was maintained. Wattle bark marketing continued to decline, causing some financial embarrassment to African district councils.

Southern Province.—Inspection Services in Kitui District were tightened with a resultant improvement in revenue from cesses. In Machakos, however, the greater network of roads which leave the district made cess collection difficult and it was estimated that only half the exports of vegetables, fruit, grains, castor seed, fowls and eggs were recorded and paid cess.

Coast Province.—The inspection service continued in Taita and Kwale. The cotton, cashew nut and chillie crops were inspected as in previous years. Inspection of the cashew nut crop was complicated by very wet conditions in December resulting in a high percentage of immatures which were difficult to detect and resulted in severe storage losses.

Rift Valley Province.—The appointment of a Marketing Officer in Eldoret has been of considerable assistance to the Nandi and Elgeyo producers. Estimates of sales from this Province amount to £112,276 for maize, potatoes, poultry, eggs, ghee, coffee, pyrethrum, skins, wattle bark and wheat.

CO-OPERATION

In the Elgon Nyanza maize and coffee societies were formed into a Union. New societies were formed in all the Nyanza districts. The degree of efficiency of management of these societies varies considerably but they are becoming a feature of African life and provide training in committee work and business affairs generally.

In the Central Province efforts were concentrated on improving the efficiency of existing societies. Pig and Dairy Co-operatives did well and some 39 societies in the Meru Produce Union marketed over £25,000 of maize and controlled produce and over £127,000-worth of other produce mostly potatoes and miraa.

In the Taita District the vegetable co-operatives are in financial difficulties and their trading is on the decline. The Chillie Co-operatives and the Society at the Shimba Hills continued to function during the year.

GRADING AND INSPECTION SERVICES, MOMBASA

Inspection.—The number of packages of plants and plant products imported and inspected at Mombasa again showed a marked increase, from 530,837 in 1956 to 1,713,198 in 1957. The increase was mainly due to the importation of three shiploads of wheat from the Argentine. The value of imports rose to £2,161,273.

Imports of fresh fruit, notably apples and pears from South Africa and Italy, improved, although imports of Australian apples were reduced. Apples from Denmark were a new feature, and South African grapes increased.

Twenty-two infestations of *Trogoderma granarium* were detected during the year, of which eight occurred in malt, 11 were in mixed cargoes of food and spices from India, and three were in other commodities. All infestations were compulsorily fumigated. A number of other import consignments found to be infested, mainly with Bruchids, were ordered to be fumigated.

Grading.—Exports of maize continued from the previous year, and in January amounted to 1,265 tons Yellow maize and 1,596 tons White maize. Thereafter exports consisted principally of fourth grade White maize consigned to Bombay. During the year, 227,853 bags White maize and 21,977 bags Yellow maize were graded. The new export season opened in December with inspection beginning for shipments of Yellow maize to Japan, and White maize to Bombay. All this maize was fumigated with methyl bromide, either by Produce Control or by one of the two commercial firms now operating in Mombasa.

White haricot beans again formed the major proportion of beans exported, although there was an increase in the quantity of Canadian Wonder from 3,152 bags in 1956 to 4,084 bags in 1957.

There was an increase of 20 per cent in the quantity of potatoes exported, main supplying areas being Elburgon and Nanyuki. All exports during 1957 were of Kenya origin.

There were no exports of wheat overseas.

PRODUCE GRADED FOR EXPORT (BAGS), 1957

					Maize	Wheat	Beans	Potatoes
								Cwt.
K.1	..	..	..	..	—	930	—	—
K.2	..	..	..	..	7,676	1,115	3,087	—
K.3	..	..	..	..	14,218	770	6,818	—
K.4	..	..	..	..	227,853	84	1,212	42,851
K.5	..	..	..	..	—	133	—	—
RJ.	..	..	..	..	4,517	2	—	7,037
Total 1957	..	..			254,264	3,034	11,117	49,888
Total 1956	..	..			28,538	3,560	18,740	8,010

Figures for chillies graded are as follows:—

CHILLIES GRADED FOR EXPORT (BAGS), 1957

	<i>Capsicum minimum</i>	<i>Capsicum annuum</i>	Total
G.A.Q.	206	—	206
F.A.Q.	351	16,686	17,037
Undergrade	6,112	3,614	9,726
Reject	123	1,711	1,834
Total 1957	6,792	22,011	28,803
Total 1956	5,396	21,555	26,951

Fumigation and Conditioning.—No fumigation or conditioning was carried out at the Grain Conditioning Plant during the period, and the plant finally closed down at the end of June. All fumigation in Mombasa was undertaken by Produce Control or by one of the two commercial companies.

Revenue.—Revenue showed a slight improvement, amounting to Sh. 42,983/98, as compared with Sh. 30,607/89 for 1956.

Quelea Control

Sudan Dioch birds (*Quelea aethiopica*) again threatened severe losses to small grain growers in Kenya during 1957. The numbers of birds involved have again increased and have now reached plague proportions.

The adaptability of *Quelea* to different climatic conditions, its extreme mobility together with the changing ecology over parts of its former natural habitat have provided the species with an abundant food supply in the form of cultivated crops, to carry it over periods of drought. This rapidly increasing population development believed to emanate from the main Tanganyika breeding grounds gained added impetus in 1957 from a favourable climatic breeding season which commenced in February and continued until mid-July.

Biological studies of the bird confirm previous findings that the very high fertility of the species is neither offset by increasing predator numbers nor by any outbreak of contagious disease. Examination of gonads and ovaries of adult birds at breeding colonies and for some time afterwards suggests the possibility that two or even more clutches could be reared during a suitably long breeding season. These facts together with the low natural mortality and long life-span of the bird (at least five years) presents an alarming and increasing problem for the immediate future, unless some unforeseen natural catastrophe occurs, i.e. 5½ million pairs of *Quelea*, rearing only three young per year, could generate a population of something in the region of a thousand million birds within a period of only five years.

Availability of food and water appears to have been the natural limiting factor in the past but is being upset by increased cultivation of small grains and by a greatly extended migratory range.

Control.—Action was necessary to deal with a few concentrations in the higher altitudes in January. Short rain crops at Naro Moru were invaded by small concentrations from February to late March and several blow-ups were necessary.

Three small breeding colonies were destroyed with flame-throwers in the Magadi-Uaso Nyiro areas of the South Kenya Rift in early July.

The main crop invasion into the Rift Valley wheat belt was again observed to originate from the south using the Rift Valley as the main migratory route. Migrating swarms commenced entering the wheat areas in late August and continued to do so until mid-December. Sustained control action had to be maintained to prevent disastrous losses.

The Mwea/Tebere irrigation scheme suffered two small invasions of *Quelea* in December which necessitated control in order to save a good rice crop from complete destruction.

An estimated total of 13,170,000 *Quelea* were destroyed during the year in 32 blow-ups, seven aerial sprays and three flame-throwing operations.

An estimated saving of 150,000 bags of grain worth some £325,000 and £6,000 of rice was achieved by control.

When not engaged on control the Bird Control Officer is undertaking biological research on *Quelea* and is making a study of migratory routes, artificial roosting sites, chemical control, bird-proof sorghums and millets and the population development of other harmful species.

PART IV—GENERAL

Library

Some 200 new books (excluding bound volumes of periodicals) were added to the library during the year and the following journals were added to those already taken by the Department: *The Analyst*, *Ecology*, *The Grower* and *New Zealand Journal of Science and Technology* (Series A). With an adequate staff for the first time for several years it has been possible to make improvements in routine methods, which have been a great help in dealing with the increasing volume of work. Some progress has been made with binding periodicals for outstations. The exchange scheme for missing parts of journals continued to be useful. Four issues of the *Newsletter* appeared during the year, an innovation being the inclusion of a cartoon. The Librarian visited three provincial headquarters libraries and one district library during the year. At the end of the year, the Library Assistant passed the First Professional Examination of the Library Association (U.K.).

Publications

The following is a list of articles by departmental officers published during the year:—

- Birch, W. R.—Pasture Problems; Work at the High-altitude Grassland Station. *The Kenya Farmer*, July/August, 1957, p. 58.
- Bock, K. R.—Investigations of Coffee Berry Disease—Laboratory Studies. *Coffee Bd. Bull.* 22, 155. (Reprinted from *E. Afr. agric. J.*, v. 22, No. 2, Oct., 1956.)
- Brown, L. H.—Development and farm planning in the African areas of Kenya. *E. Afr. agric. J.* 23, 67.
- Bumpus, E. D.—Establishment and management of medium altitude leys. *E.A. Fmr. and Planter*, v. 1, No. 11, p. 39 (August, 1957).
- Grass and legume mixtures for leys on medium altitude farms. *E.A. Fmr. and Planter*, v. 1, No. 10, p. 62 (July, 1957).
- Grassland Research. *The Kenya Farmer*, May/June, 1957.
- Legume inoculation in Kenya. 1.—Exploratory field experiments. *E. Afr. agric. J.* 23, 91.

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Agricultural Legislation

The more important legislative measures enacted during the year were:—

1. *The Canning Crops Ordinance (No. 27 of 1957).*—The Ordinance establishes a statutory Board to control the production and processing of crops grown for sale for canning purposes, the object being to relate the amount of crops grown to the capacity of the canning industry, to maintain standards of quality and to standardize prices. At present the Ordinance only applies to pineapples, but it can be extended to other fruit and vegetables by adding these to the Second Schedule.

2. *The Agricultural Produce (Horticultural Produce Inspection) Rules, 1957.*—These rules cover the conditions under which horticultural produce may be exported and lists the produce covered by the rules.

3. *The Plant Protection (Import Control) (Amendment) Order, 1957.*—This amends paragraph 1 of the old Order, the principal amendment being that imports are now allowed from the other East African territories without permit with the exception of certain plants and seeds, specified in Schedule II. A new Schedule I lists the plants and seeds for which permits are required for any quantity; all other seeds exceeding 1 lb. in weight also require permits.

4. *The Pyrethrum (Amendment) Ordinance (No. 32 of 1957).*—The amendments are designed to permit growers outside Kenya to sell and deliver pyrethrum to the Pyrethrum Board of Kenya, to pay any levy imposed and to be issued with stock as if they were growers in Kenya. The opportunity is taken to make various other minor amendments.

5. *The Seeds Rules, 1957.*—These rules cover sampling methods, standards of purity and germination, trueness to variety, freedom from disease, etc., applications for inspection, certificates for inspection, Government tested seeds, Government certified seeds and seed potatoes, registration of seed growers and seed merchants.

6. *The Cereal Producers Rules, 1957.*—These rules specify the cereals to which the Ordinance applies and the quantity (200 bags) to be delivered to entitle a grower to be registered as a cereal producer.

An Order under the *Cereal Producers Ordinance* imposes a cess of 22 cents a bag on wheat and 8 cents a bag on the other cereals specified in the Schedule.

7. *The Importation (Malt and Malt Bags) (Trogoderma) Order, 1957.*—Under the Plant Protection Ordinance, this prohibits the importation of malt and malt bags except under a certificate of fumigation and specifies the powers of inspectors regarding the disinfection of ships, vehicles and aircraft as well as bags, and destruction of bags.

An Order under the *Plant Protection Ordinance* declares *Trogoderma granarium* and *Araecerus fasciculatus* to be pests under the Ordinance.

8. *The Land Preservation (Non-Scheduled Areas) Rules, 1957.*—These empower a district commissioner, subject to the provisions of section 159 of the Agriculture Ordinance, to issue a Land Preservation Order to any person having any right or interest in land, requiring or prohibiting any act or thing to be performed or done and imposing conditions. The form of order is set out in the Schedule to the Rules.

9. *The Miraa Prohibition (Scheduled Areas) (Amendment) Ordinance*.—By this the Provincial Commissioner is enabled to issue permits, subject to such conditions as he sees fit to impose, to sell, purchase, consume, use or possess miraa.

10. *The Production of Food Crops Rules, 1957, under the Agriculture Ordinance, 1955*.—These rules (which apply to the Scheduled Areas only) lay down the form in which production programmes and production orders shall be set forth; the method of declaring latest date of claim for guaranteed minimum returns and earliest and latest dates of planting; the conditions to be attached to a production order, and prohibits the retention of essential crops without the Board's permission. These Rules replace the 1956 Rules.

Staff

The following promotions were confirmed during the year: Mr. L. H. Brown, Deputy Director, Messrs. T. Hughes-Rice and G. Gamble, Assistant Directors (Field); and Messrs. R. J. Spooner and E. C. M. Green, Provincial Agricultural Officers. Messrs. E. Bellis, E. D. Bumpus, and P. A. Jones were promoted Senior Research Officers on the super-scale. Mr. G. J. Gollop, Provincial Agricultural Officer retired at the end of March after completing 21 years' service with the Department. Mr. J. H. Midgley, Senior Assistant Agricultural Officer at Kitale, retired in May after 12 years' service.

Six new Agricultural Officers arrived after completing their training in Trinidad—Messrs. M. F. Watson, T. Chapman, G. E. J. Morley, T. R. Evans, J. O. Luterbacher and J. A. Milne. Dr. E. J. Guthrie joined the Research Services in April as a Plant Pathologist. Under the I.C.A. scheme two officers joined the Department—Messrs. C. R. Enlow, Senior Agriculturist and Dr. A. Mehlich a Soil Chemist, both of the Headquarters section. Mr. J. D. White joined the Department in July as Soil Conservation Engineer. Recruitment of Assistant Agricultural Officers once again improved and at the end of the year there were only 11 vacant posts in the total establishment. During the year nine officers were promoted to S.A.A.O. vacancies.

My thanks are due to all members of the Department for their good work in 1957.

Nairobi,
7th February, 1958.

R. J. M. SWYNNERTON,
Director of Agriculture.

